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Article

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Leanne Payne[1], Sanna L. Roest[2], Zhen Qi Lu[1], Nardia Zendarski[3], Matthew Bisset[4], Emma Sciberras[3,4,5], Stephen Stathis[1,6], Bart M. Siebelink[2], Robert R. J. M. Vermeiren[2,7], Mark A. Bellgrove[8], David Coghill[3], and Christel M. Middeldorp[1,6]

Abstract

Objective: Previous studies at child and youth mental health services (CYMHS) suggest that children with ADHD have poorer outcomes compared to those with other diagnoses. This study investigates this in more detail. **Methods:** Children with ADHD were compared to those with ASD and those with emotional disorders, on routinely collected outcomes at CYMHS in Australia ($N = 2{,}513$) and the Netherlands ($N = 844$). **Results:** Where the emotional disorders group reached a similar level of emotional symptoms at the end-of-treatment as the ADHD and ASD groups, the latter two groups still had higher scores on ADHD and ASD symptoms (attention and peer problems). The poorer outcomes were mainly explained by higher severity at baseline. In Australia, an ADHD and/or ASD diagnosis also independently contributed to worse outcomes. **Conclusion:** Those with neurodevelopmental disorders within both countries had poorer outcomes than those with emotional disorders. Services should aim to optimize treatment to ensure best possible outcomes. (*J. of Att. Dis. 2022; 26(14) 1914-1924*)

Keywords

ADHD, autism spectrum disorder, emotional disorders, community mental health service, child and adolescent mental disorders, treatment outcomes, service evaluation

Child and Youth Mental Health Services (CYMHS) often treat children and adolescents with a wide variety of mental disorders, for example, neurodevelopmental disorders, such as ADHD and Autism Spectrum Disorder (ASD), as well as emotional disorders, such as anxiety and depression. Assessment and treatment in these services are usually provided by multidisciplinary teams, comprising child and adolescent psychiatrists, psychologists, and other allied health workers, who can deliver a range of pharmacological and non-pharmacological interventions, including psychotherapy and parental guidance. Several studies focusing on treatment outcomes in CYMHS as assessed with the routine outcome measures (ROM) completed by clinicians, parents and children, or adolescents during treatment have shown substantial improvement when comparing scores at start and end of treatment (Bonadio & Tompsett, 2018; Brann & Coleman, 2010; Garralda et al., 2000; Lu et al., 2022; Lundh et al., 2013; Murphy et al., 2015; Wolpert et al., 2016). However, these studies also reported that not all children improved over the course of treatment or that symptoms did not decrease to the non-clinical range (Brann & Coleman, 2010; Lu et al., 2022; Murphy et al., 2015; Roest et al., 2021; Wolpert et al., 2016). A diagnosis of ADHD has been found to be associated with worse outcomes (Edbrooke-Childs et al., 2017; Garralda et al., 2000; Lundh et al., 2013; Roest et al., 2021). This paper extends this finding by comparing in more detail outcomes between children with

[1]University of Queensland, St Lucia, Australia
[2]Leiden University, The Netherlands
[3]University of Melbourne, Parkville, VIC, Australia
[4]Deakin University, Burwood, VIC, Australia
[5]Murdoch Children's Research Institute, Parkville, Australia
[6]Children's Health Queensland Hospital and Health Service, South Brisbane, Australia
[7]Parnassia Groep, Hague, The Netherlands
[8]Monash University, Melbourne, Clayton, VIC, Australia

Corresponding Author:
Leanne Payne, Child Health Research Centre, University of Queensland, Level 6, 62 Graham Street, South Brisbane, QLD 4101, Australia.
Email: Leanne.payne@uq.edu.au

ADHD and with other disorders treated at CYMHS across two countries, that is, Australia and the Netherlands.

Three large studies in CYMHS found that ROM scores improved less for those with ADHD than for children with emotional disorders (Edbrooke-Childs et al., 2017; Lundh et al., 2013; Roest et al., 2021), although Edbrooke-Childs et al. (2017) reported this did not survive adjustment for expected outcomes (i.e., regression to the mean). A smaller study (Garralda et al., 2000) found that children with anxiety or conduct disorders were similar to the children with ADHD, but these groups all did less well than children with stress and mood disorders. This may seem unsurprising because of the known differences in the natural course between ADHD and emotional disorders, with ADHD persisting through childhood and adolescence and often into adulthood (Posner et al., 2020), while childhood or adolescent emotional disorders often take a more waxing and waning course (Beesdo-Baum & Knappe, 2012; Hazell, 2011). Still, clinical medication trials have reported large ADHD symptom reduction (Caye et al., 2019), on par or even better than the results reported in trials for pharmacological or psychological treatment of, for example, depression (Zhou et al., 2020), suggesting that treatment outcomes for ADHD should not necessarily be worse than for children with other disorders treated in CYMHS.

The evidence from the previous studies is limited as most studies analyzed only one tool to assess treatment outcomes, did not provide details on the type of symptoms that were persisting, and did not specifically focus on ADHD (Edbrooke-Childs et al., 2017; Garralda et al., 2000; Lundh et al., 2013; Roest et al., 2021). Moreover, except for one, they were all performed in one country. In the one cross-country study, (Roest et al., 2021), similar results were found in an Australian and a Dutch community outpatient cohort, that is, the portion of children with ADHD scoring in the non-clinical range on the Children's Global Assessment Scale (CGAS; Shaffer et al., 1983) was lower at the end of treatment compared to children with internalizing disorders.

To investigate in more detail whether outcomes of children with ADHD treated in CYMHS are worse compared to children with other disorders, we performed a more comprehensive analysis by not only testing differences in total scores across diagnoses, but also subscale scores and specific symptoms. We further also considered differences in baseline scores over the groups, to get a better insight in the course of the symptoms over treatment. Since Autism Spectrum Disorder (ASD) is also a neurodevelopmental disorder, and previous studies have found their outcomes to be similar to those with ADHD (Edbrooke-Childs et al., 2017; Roest et al., 2021), we separately studied those with ASD but without ADHD. We used the same two cohorts as Roest et al. (2021) which allowed a more in-depth comparison between Australia and the Netherlands. The cross-country comparison is important as while both services deliver specialized mental health care to a large mostly urban area, there are some notable differences. In the Netherlands, publicly funded CYMHS are in general the first port of call to provide treatment to children with neurodevelopmental disorders such as ADHD and ASD. In Australia, many children with ADHD are assessed and treated by paediatricians, either in the public or in the private system, and often only children with co-morbid problems with a neurodevelopmental disorder are assessed and treated by the publicly funded CYMHS. As both countries use the same routine outcome measures (ROM), they are well comparable.

Methods

Design and Procedure

This was an observational study of children and adolescents aged 5 to 18 years treated at all public outpatient CYMHS clinics, which include urban and suburban regions, as part of Children's Health Queensland (CHQ) Hospital and Health Service in the greater area of Brisbane, Australia and LUMC-Curium, in Leiden and its surroundings in the Netherlands. Both sites provide tertiary level services. Data from 2013 to 2018 were collected during treatment as part of routine service practice and obtained from the electronic records. Ethics approval for use of the Australian data was obtained from CHQ, Human Research Ethics Committee (HREC/17/QRCH/321). It was also approved by the Health Innovation, Investment and Research Office, Queensland Health, in accordance with the Public Health Act 2005. For the Netherlands data approval was obtained from the LUMC-Curium's Medical Ethics Committee.

Children with treatment episodes that began and concluded between 2013 and 2018 were included in the study. To ensure we only included children who received treatment, those with an episode duration of less than 30 days were excluded from the analyses. A treatment episode is defined as a continuous period of service provision from first appointment (where there has been no contact in the previous 3 months) through to discharge (without contact in the following 3 months). To allow a focus on children treated only at outpatient community clinics, children with inpatient admissions while being managed by either service were also excluded. Where a child had multiple treatment episodes within the target time frame, we chose to analyze only the first.

Demographic, Clinical, and Outcome Measures

All information was obtained from electronic health records and was collected as part of routine care. Demographic and service usage information included gender, age at start of episode, and length of episode.

Diagnoses. Children were allocated to diagnostic groups as established by the multidisciplinary clinical teams which included both psychiatrists and psychologists. Diagnoses at CHQ were coded according to the International Statistical Classification of Diseases and Related Health Problems 10th revision ICD-10 (World Health Organization, 2004). At LUMC-Curium diagnoses were classified according to the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2000) Axis I or II. For this study children were included who had a recorded diagnosis of ADHD, ASD, or emotional disorders. For CHQ, those who were diagnosed with any ICD-10 hyperkinetic disorder, that is, codes F90.0, F90.1, F90.8, or F90.9, were allocated to the ADHD group, regardless of any additional diagnoses. Those who were diagnosed with F84.0 to F84.9 *without* any hyperkinetic disorder, but regardless of any other additional diagnoses, were allocated to the ASD group. Children with any anxiety, mood, stress, or adjustment disorder but *without* any hyperkinetic or F84 developmental disorder, were allocated to the emotional disorders group (see Supplemental Table 1 for specific F-codes). For LUMC-Curium, children were similarly allocated to groups but with respect to DSM-IV 314 diagnoses for the ADHD group, and 299 diagnoses for the ASD group (see Supplemental Table 2 for specific DSM-IV diagnoses for the emotional disorders group).

ROM. ROM in both countries include the Health of the Nation Outcome Scales for Children and Adolescents (HoNOSCA; Gowers et al., 2003), and the Strengths and Difficulties Questionnaire (SDQ; R. Goodman, 1997).

The HoNOSCA is clinician reported and assesses severity of problems across 15 areas, including behavioral, emotional, and attention problems. We used a total score (range 0–52) calculated by summing items 1 to 13 and excluding items 14 to 15. Ratings ≥ 2 on any item indicate a clinically significant problem (Gowers et al., 2003).

The SDQ is parent/carer reported and describes children and adolescents' behaviors, emotions, and relationships. The four problem subscale scores (range 0–10) for emotional symptoms, conduct problems, hyperactivity, and peer problems, and a total difficulties score (range 0–40) were utilized in this study (R. Goodman, 1997). For Australian data, a total difficulties score ≥ 17 and emotional symptoms, conduct problems, hyperactivity, and peer problems scores >4, 3, 6, and 3, respectively, indicate a clinically significant problem (R. Goodman, 1997; A. Goodman & Goodman, 2009). For Dutch children, total difficulties scores >14, 13, and 11 indicate a clinically significant problem for ages 4 to 7, 8 to 12, and 13 to 18 years, respectively, as do emotional symptom scores >3, 4, and 3 and conduct problem scores >3 for all ages (Theunissen et al., 2016). Normative Dutch cut-off scores are not available for the hyperactivity and peer problems subscales.

Both ROM have sound psychometric properties (Pirkis et al., 2005). We used baseline and end ROM scores, defined as scores collected within 90 days of the start or end service date.

Statistical Analyses

Statistical analyses were performed in SPSS Statistics for Windows Version 25. Missing data were dealt with by firstly identifying valid ROM values according to the National Outcomes and Casemix Collection (NOCC) criteria (AMHOCN, 2009). For the HoNOSCA, a minimum of 11 of the first 13 items had to have a valid rating or the case was deemed invalid. For the SDQ, at least three of the five items in all categories had to have a valid score. For CHQ cases with valid but incomplete HoNOSCA or SDQ scores, multiple imputations were used to generate missing values, maintaining the variance and covariances of individual/global scores (Schlomer et al., 2010). We used the automatic imputation method in SPSS to choose the most appropriate imputation method based on the dataset. We generated a total of 10 runs of imputation for all of the missing ROM subscores for the pooled data. Children with entirely missing or otherwise invalid ROM scores were excluded from that particular analysis. Missing items were treated similarly for the LUMC-Curium SDQ data, with the exception that missing HoNOSCA items were scored as zero.

All analyses were performed within-country. Chi-squared tests of independence and univariate ANOVAs were calculated to examine differences between the three diagnostic groups on categorical and continuous variables, respectively. Pairwise comparisons for categorical variables were calculated using the z-test of two proportions. Tukey-Kramer post hoc tests were calculated for all significant group differences for continuous variables. Box plot analyses of the duration of episode variable revealed a large number of outliers in each group so the non-parametric Kruskal-Wallis H test was used to compare group medians, and pairwise comparisons were performed using Dunn's (1964) procedure with adjusted p-values presented.

Improvement across time was assessed by comparing the percentage of children in the clinical range for each ROM at baseline and end-of-treatment between diagnostic groups. For the HoNOSCA this was assessed at the item level as a clinical cut-off for the total score has not been developed. Due to the large number of planned tests we set the significance level at .001.

Results

The final sample from CHQ included 2,513 children and adolescents of whom 326 met the criteria for the ADHD group, that is, an ADHD diagnosis including any other comorbid diagnoses such as ASD or emotional disorders, 182

Table 1. Demographic and Service Characteristic, and Psychiatric Diagnoses by Diagnostic Group and Country.

	CHQ-Australia			LUMC-Curium-Netherlands		
	ADHD (*n* = 326)	ASD (*n* = 182)	Emotional disorders (*n* = 2,005)	ADHD (*n* = 401)	ASD (*n* = 203)	Emotional disorders (*n* = 240)
Male *n* (%)	241 (73.9)	129 (70.9)	719 (35.9)	268 (66.8)	144 (70/9)	85 (35.4)
Age at start of episode (years)	10.90 (*SD* 3.15)	11.56 (*SD* 3.28)	13.58 (*SD* 2.92)	10.60 (*SD* 3.32)	11.32 (*SD* 3.41)	12.93 (*SD* 3.09)
Episode duration (days) *Med*	250.93	224.22	187.85	418.00	349.0	339.50
	ICD-10 F codes			DSM-IV axis I/axis II		
Number of psychiatric diagnoses *n (%)*						
1	45 (13.8)	41 (22.5)	1,144 (57.1)	200 (49.9)	133 (65.5)	124 (51.7)
2	110 (33.7)	76 (41.8)	606 (30.2)	142 (35.4)	61 (30.0)	89 (37.1)
3	109 (33.4)	43 (23.6)	196 (9.8)	46 (11.5)	8 (3.9)	20 (8.3)
>3	62 (19.0)	22 (12.0)	59 (2.9)	13 (3.2)	1 (0.01)	7 (2.9)
Psychiatric diagnoses						
Autism spectrum disorder	85 (26.1)	182 (100.0)	na	64 (16.0)	203 (100)	na
Other developmental/conduct disorders	116 (35.6)	41 (22.5)	165 (8.2)	81 (20.2)	19 (9.4)	22 (9.2)
Emotional disorders	145 (44.5)	104 (57.1)	2,005 (100.0)	50 (12.5)	23 (11.3)	240 (100)
Anxiety disorders	87 (26.7)	74 (40.7)	1,008 (50.3)	27 (6.7)	6 (3)	140 (58.3)
Mood disorders	22 (6.7)	25 (13.7)	566 (28.2)	22 (5.5)	13 (6.4)	102 (42.5)
Stress related disorders	30 (9.2)	13 (7.1)	450 (22.4)	2 (<.01)	4 (.02)	27 (11.3)
Adjustment disorders	29 (8.9)	15 (8.2)	406 (20.2)	4 (.01)	0 (0)	3 (1.3)
Other psychiatric disorders	40 (12.3)	28 (15.4)	268 (13.4)	12 (3.0)	5 (2.5)	41 (17.1)

met the criteria for the ASD group, that is, an ASD diagnosis and any other co-morbid diagnoses, except for ADHD, and the remaining 2005 met the criteria for the emotional disorders group, that is, a diagnosis of any anxiety, mood, stress, or adjustment disorder but no ADHD or ASD. For LUMC-Curium, the final sample included 844 children, with 401 meeting the criteria for the ADHD group, 203 for the ASD group, and 240 for the emotional disorder group as described above. Henceforth, the term "children" includes both children and adolescents.

Comparisons of Sample Characteristics and Episode Duration

Table 1 presents demographic and service characteristics together with psychiatric diagnoses by diagnostic group and country.

For both CHQ and LUMC-Curium, there were significantly more males in both the ADHD and ASD groups compared with the emotional disorder groups ($\chi^2(2) = 226.81$, $p \leq .001$ *and* $\chi^2(2) = 77.24$, $p \leq .001$, respectively) and they were, overall, on average 2.68 years/2.34 and 2.02/1.61 years younger than those in the emotional disorders group ($p < .001$, 95% CI [2.3, 3.1]/$p < .001$, 95% CI [1.7, 3.0] and $p < .001$, 95% CI [1.5, 2.6], 95% CI [0.9, 2.4], respectively) at baseline. The difference in ages at baseline between the ADHD and ASD groups was not significant for either CHQ or LUMC-Curium.

For CHQ and LUMC-Curium, the median episode length for those in the ADHD group were 63.08 and 78.05 days longer, compared to the emotional disorders group ($p \leq .001$). The episode duration for the ASD group did not significantly differ from the ADHD group or the emotional disorders group in both sites.

The degree of comorbidity (i.e., one vs. two or more psychiatric diagnoses) differed significantly between the groups at both CHQ and LUMC-Curium ($\chi^2(2) = 264.74$, $p \leq .001$ and $\chi^2(2) = 14.11$, $p \leq .001$, respectively). At CHQ the ADHD group included a greater proportion of children with two or more psychiatric diagnoses than both other groups, while the ASD group had more such children than the emotional group. For LUMC-Curium, the ADHD and emotional disorder groups had a greater proportion of children with two or more diagnosis than the ASD group (see Supplemental Table 1 for a more detailed breakdown of diagnoses and corresponding ICD-10 and DSM-IV categories).

Comparison of Baseline and End-of-Treatment ROM Scores Between the ADHD, ASD, and Emotional Disorders Group

Mean baseline and end-of-treatment HoNOSCA and SDQ total and subscale scores, standard errors, and post hoc comparison indicators of significance are presented in Figure 1 with further details in supplementary Table 2. In

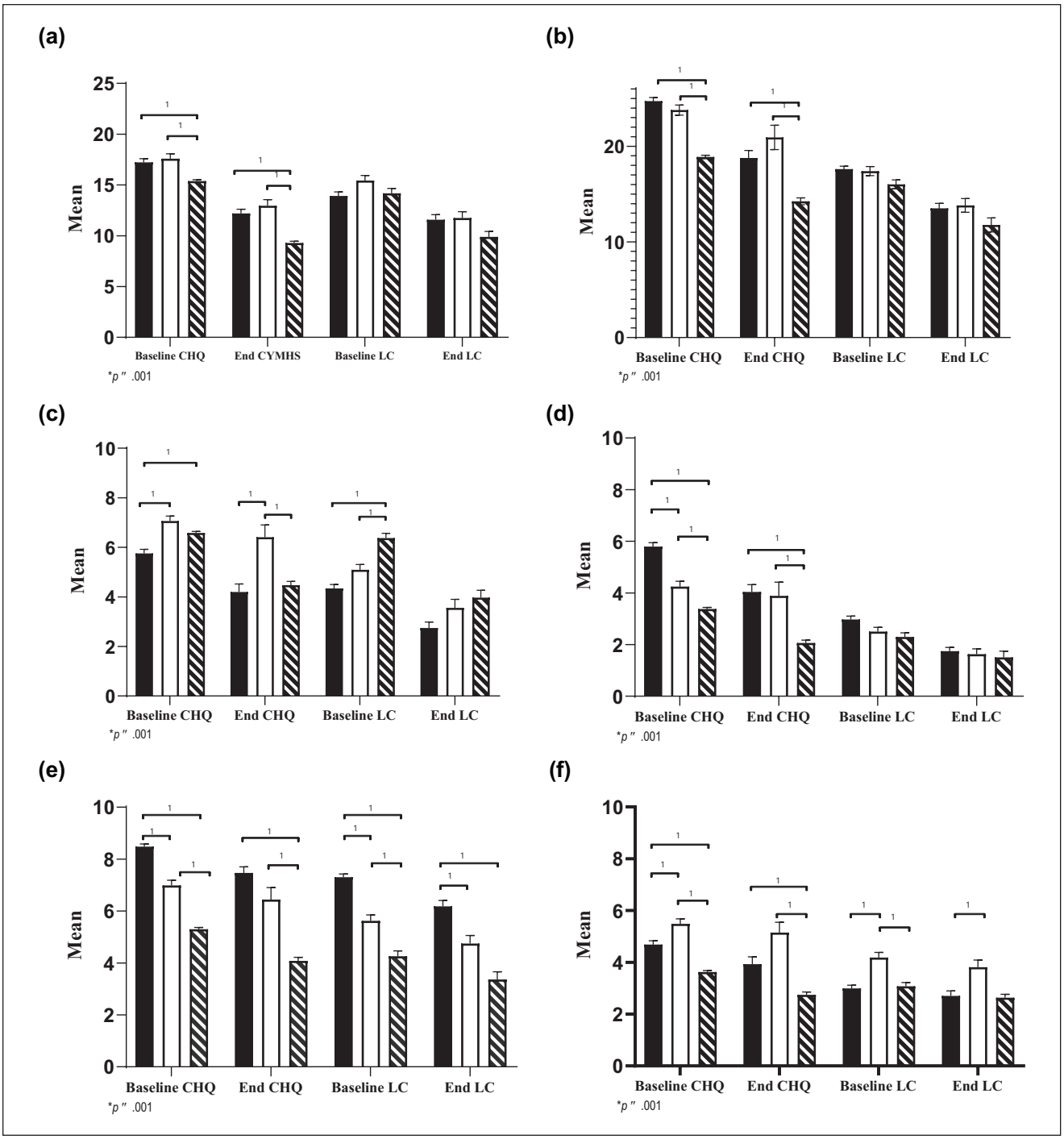

Figure 1. (a) Mean HoNOSCA-total scores at baseline and end of-treatment, (b) mean SDQ total difficulties scores at baseline and end of-treatment, (c) mean SDQ emotional symptom scores at baseline and end of-treatment, (d) mean SDQ conduct problem scores at baseline and end of-treatment, (e) mean SDQ hyperactivity scores at baseline and end of-treatment, and (f) mean SDQ peer problem scores at baseline and end of-treatment.

Note. Baseline ADHD, ASD, emotional disorders: HoNOSCA, CHQ*n* = 284, 157, 1,794, LUMC-curium*n* = 178, 99, 141, SDQ total difficulties and all subscales, CHQ*n* = 253, 133, 1,445, LUMC-curium*n* = 255, 126, 166. End-of-treatment ADHD, ASD, emotional disorders: HoNOSCA, CHQ*n* = 239, 121, 1,361, LUMC-curium *n* = 150, 94, 147. SDQ total difficulties and all subscales, CHQ *n* = 72, 27, 313, LUMC-curium *n* = 98, 59, 63.

ADHD.

ASD.

Emotional disorders.

Table 2. Percentage of Children in the Clinical Range at Start and End-of-Treatment for HoNOSCA Items and the SDQ Within CHQ (Australia) by Group.

	ADHD		ASD		Emotional Disorders		χ^2 (*p*)	
	Start	End	Start	End	Start	End	Start	End
n	284	239	157	121	1,794	1,361		
1. Disruptive, antisocial, or aggressive	75.4	41.8	57.3	35.5	32.9	16.4	205.34 (<.001)	94.51 (<.001)
2. Over-activity, attention, or concentration	89.1	75.7	67.5	53.7	51.6	25.4	147.79 (<.001)	249.56 (<.001)
3. Non-accidental self-injury	19.0	5.9	21.0	5.8	37.0	9.3	47.58 (<.001)	4.43 (.109)
4. Alcohol, substance, or solvent abuse	5.6	3.8	4.5	5.0	13.5	9.8	23.56 (<.001)	11.53 (.003)
5. Scholastic or language skills	69.7	59.0	71.3	63.6	36.6	22.8	163.62 (<.001)	191.86 (<.001)
6. Physical illness or disability problems	11.3	8.4	17.2	9.9	9.3	6.8	10.36 (.006)	2.07 (.355)
7. Hallucinations or delusions	6.7	2.9	9.6	5.8	13.9	4.8	13.12 (.003)	2.07 (.355)
8. Non-organic somatic symptoms	25.0	15.5	33.8	21.5	37.7	17.1	11.23 (.001)	2.06 (.356)
9. Emotional and related symptoms	87.3	63.6	93.0	74.4	97.5	66.7	69.35 (<.001)	4.25 (.120)
10. Peer relationships	72.5	52.7	80.3	64.5	62.3	35.7	28.96 (<.001)	56.64 (<.001)
11. Self-care and independence	31.3	23.0	37.6	33.9	18.1	12.3	53.42 (<.001)	52.28 (<.001)
12. Family life and relationships	83.5	60.3	79.6	66.9	81.5	60.7	1.07 (.585)	1.91 (.386)
13. Poor school attendance	25.0	13.0	35.7	23.3	37.7	20.1	17.13 (<.001)	7.37 (.025)
n	253	72	133	27	1,445	313		
SDQ total difficulties	91.7	65.3	87.2	70.4	64.2	33.9	97.82 (<.001)	33.48 (<.001)
SDQ emotional symptoms	70.0	41.7	85.0	77.8	79.9	47.9	16.01 (<.001)	10.64 (.005)
SDQ conduct problems	83.0	36.1	61.7	33.3	44.8	10.9	132.12 (<.001)	32.46 (<.001)
SDQ hyperactivity	86.6	94.4	63.2	77.8	32.9	41.2	279.05 (<.001)	73.74 (<.001)
SDQ peer problems	70	38.9	82.7	70.4	50.7	19.8	74.65 (<.001)	39.59 (<.001)

addition, Tables 2 and 3 show the proportion of children in the clinical range on the individual HoNOSCA items and the SDQ problem scales at baseline and end-of-treatment, respectively, for CHQ and LUMC-Curium.

Baseline. At CHQ, the ADHD and ASD groups were more severely affected at baseline than the emotional disorders group for measures related to attention, behavior, peer, self-care, and scholastic problems as reflected by higher mean scores and by higher proportions of children scoring in the clinical range on the SDQ subscales and individual HoNOSCA items (Figure 1, Table 2, and Supplemental Table 2). In addition, they also had significantly higher mean total scores on the SDQ and HoNOSCA than the emotional disorders group (Figure 1 and Supplemental Table 2). The emotional disorders group, on the other hand, scored higher at baseline for measures related to these disorders as reflected by a higher mean score on the SDQ emotional problems subscale (only compared with the ADHD group) and higher proportion of children scoring in the clinical range for these problems as well as for non-accidental self-injury, alcohol or substance use, somatic symptoms, and poor school attendance.

At LUMC Curium, the groups did not differ as much at baseline as in CHQ (Figure 1, Table 3, and Supplemental Table 2). The ASD and ADHD group did not score higher on the HoNOSCA-total and SDQ total difficulties, and the emotional disorders group did not have more children scoring in the clinical range for self-injury, alcohol or substance use, or somatic symptoms. Where there were differences, they were largely similar as at CHQ, that is, the ADHD and ASD groups scored more often in the clinical range for measures related to attention, behavior, self-care, and scholastic problems than the emotional disorders groups while the emotional disorders group scored more often in the clinical range for emotional symptoms as well as family life and relationships. However, the emotional disorder group had a higher mean at baseline than both other groups for SDQ emotional symptoms and the ASD group scored higher than both the ADHD and the emotional disorder groups on SDQ peer problems.

End of treatment. At CHQ, the ASD and ADHD group remained more severely affected than the emotional disorders group on the same measures as at baseline (Figure 1, Table 2, and Supplemental Table 2). The emotional disorders group, on the other hand, was not more severely affected than the ASD and ADHD group on the emotional symptoms, with the ASD group scoring highest on the SDQ emotional problems subscale.

At LUMC Curium, the emotional disorders group also scored similar to the ADHD and ASD group at end-of treatment for emotional symptoms. The ADHD and ASD group were still more severely affected on attention, scholastic, and peer problems (only ASD) but not for disruptive behavior and conduct problems (Table 3).

Table 3. Percentage of Children in the Clinical Range at Start and End-of-Treatment for HoNOSCA Items and the SDQ Within LUMC-Curium (the Netherlands) by Group.

	ADHD		ASD		Emotional disorders		χ^2 (p)	
	Start	End	Start	End	Start	End	Start	End
n	178	150	99	94	141	147		
1. Disruptive, antisocial, or aggressive	47.8	30.7	49.5	21.3	24.8	14.3	21.60 (<.001)	11.58 (.003)
2. Over-activity, attention, or concentration	88.2	71.3	65.7	45.7	46.1	22.4	65.36 (<.001)	71.31 (<.001)
3. Non-accidental self-injury	3.9	3.3	5.1	1.1	12.1	4.1	8.76 (.013)	1.81 (.404)
4. Alcohol, substance, or solvent abuse	4.5	4.7	0.0	2.1	5.0	3.4	4.88 (.087)	1.10 (.577)
5. Scholastic or language skills	50.0	41.3	49.5	34.0	29.1	17.7	16.42 (<.001)	20.17 (<.001)
6. Physical illness or disability problems	7.3	6.7	13.1	10.6	14.2	8.80	4.40 (.111)	1.23 (.541)
7. Hallucinations or delusions	4.5	3.3	13.1	3.2	11.3	4.1	7.53 (.023)	0.18 (.916)
8. Non-organic somatic symptoms	14.6	9.3	22.2	11.7	31.2	17.7	12.63 (.002)	4.76 (.092)
9. Emotional and related symptoms	63.5	49.3	80.8	47.9	97.2	60.5	53.97 (<.001)	5.16 (.076)
10. Peer relationships	55.10	38.7	78.8	77.7	56.0	39.5	17.27 (<.001)	46.63 (<.001) (<.001)
11. Self-care and independence	39.9	36.0	48.5	47.9	19.1	21.1	25.38 (<.001)	19.36 (<.001)
12. Family life and relationships	48.9	41.3	55.6	38.3	69.5	53.1	13.88 (.001)	6.38 (.041)
13. Poor school attendance	11.8	14.0	23.2	11.7	34.0	17.7	22.79 (<.001)	1.76 (.415)
n	255	98	126	59	166	63		
SDQ total difficulties	81.2	57.1	79.4	57.6	76.5	47.6	1.34 (.512)	1.71 (.425)
SDQ emotional symptoms	57.6	27.6	68.3	40.7	85.5	52.4	36.30 (<.001)	10.23 (.006)
SDQ conduct problems	58.0	25.5	46.0	22.0	39.2	23.8	15.15 (.001)	0.25 (.884)

Note. NB: Clinical cut-off scores are not available for the subscales of hyperactivity and peer problems in the Dutch population.

Post Hoc Analyses

Given the differences in outcomes between the diagnostic groups both at baseline and end-of-treatment, a multiple regression analysis was conducted for each of the ROM, for both sites, to examine the relative contribution of diagnosis and baseline scores in the prediction of end-of-treatment scores. Predictors included in each model were gender, age at baseline, baseline ROM scores, a diagnosis of ADHD, a diagnosis of ASD, and a diagnosis of an emotional disorder. The diagnosis variables were not mutually exclusive, for example, a child with ADHD and ASD would score 1 on both variables which also accounts for comorbidity bias within the group allocation. Regression coefficients, standard errors, and significance are presented in Table 4. For both CHQ and LUMC-Curium, baseline score was the only significant predictor for the HoNOSCA-total, SDQ total difficulties and all subscales. At CHQ diagnoses of ADHD and ASD approached significance for the HoNOSCA-total as did a diagnosis of ADHD for the SDQ hyperactivity subscale. At LUMC-Curium a diagnosis of ASD approached significance for SDQ peer problems.

Discussion

The aim of this study was to examine whether children and adolescents with ADHD have poorer outcomes in terms of symptom reduction than those with other psychiatric disorders treated at CYMHS within two countries: CHQ, Australia and LUMC-Curium, the Netherlands. This study extends an earlier study analyzing the same sample that reported that children with ADHD improved less on a measure of global functioning than those with other disorders. An examination of total ROM scores as well as specific items and subscales in this study showed that in both countries, poorer treatment outcomes were found for the core symptoms of ADHD, that is, hyperactivity and attention problems and, related to that, scholastic skills, and for the core symptoms of ASD, that is, peer problems. In contrast, in both countries, the group with emotional disorders had similar scores on emotional symptoms as both other groups at the end of treatment. Finally, only in Australia, those with ADHD and/or ASD were more severe at the end of treatment than those with emotional disorders for total scores and conduct problems. Regression analyses showed that the more severe end scores were mostly explained by the higher baseline scores at the beginning of treatment. This also explains why the differences were more pronounced in CHQ, where those with ADHD and ASD were more severe at baseline for the HoNOSCA-total, SDQ total, and subscale scores (apart from emotional symptoms) while in LUMC-Curium baseline scores for those diagnostic groups were more severe only for the core symptoms. In addition to worse baseline scores, a diagnosis of ADHD or ASD seemed to also contribute to worse outcomes for HoNOSCA-total and hyperactivity (only ADHD) in Australia, and a diagnosis of ASD to peer problems in the Netherlands (all approaching significance).

Table 4. Summary of Post Hoc Multiple Regression Analyses Predicting End-of-Treatment Scores on the HoNOSCA and SDQ Within CHQ (Australia) and LUMC-Curium (the Netherlands).

	B	*SE*β	β	*p*-Value	*B*	*SE*β	β	*p*-Value	*B*	*SE*β	β	*p*-Value
	CHQ											
Variable	HoNOSCA-total				SDQ total difficulties				SDQ emotional symptoms			
Age	−0.038	0.050	−.018	.450	−0.108	0.115	−.047	.349	0.001	0.042	.001	.990
Sex	−0.511	0.314	−.039	.104	0.327	0.675	.024	.628	0.259	0.259	.046	.318
ADHD diagnosis[a]	1.530	0.544	.080	.005	1.420	1.093	.079	.194	0.053	0.373	.007	.888
ASD diagnosis[a]	1.526	0.530	.071	.004	3.042	1.134	.141	.008	1.016	0.440	.108	.021
Emotional disorder diagnosis[a]	−0.123	0.667	−.006	.854	1.264	1.381	.058	.361	0.166	0.306	.026	.588
Baseline scores	0.464	0.026	.409	<.001	0.428	0.050	.445	<.001	0.493	0.050	.446	<.001
	SDQ conduct problems				SDQ hyperactivity				SDQ peer problems			
Age	−0.058	0.030	−.079	.059	−0.058	0.34	−.066	.086	0.003	0.029	.004	.929
Sex	0.193	0.181	.043	.286	−0.220	0.204	−.040	.282	−0.130	0.177	−.029	.462
ADHD diagnosis[a]	0.418	0.266	.067	.117	0.901	0.310	.119	.004	0.164	0.258	.027	.524
ASD diagnosis[a]	0.545	0.307	.072	.077	0.630	0.345	.069	.069	0.694	0.312	.093	.026
Emotional disorder diagnosis[a]	−0.266	0.213	−.052	.213	−0.195	0.239	−.031	.416	0.081	0.207	.016	.695
Baseline scores	0.486	0.037	.557	<.001	0.540	0.540	.571	<.001	0.579	0.039	.602	<.001
	LUMC-Curium											
	HoNOSCA-total				SDQ total difficulties				SDQ emotional symptoms			
Age	0.368	0.117	.201	.002	−0.284	0.115	−.175	.014	−0.086	0.042	−.125	.040
Sex	−1.375	0.799	−.110	.086	0.713	0.788	.063	.366	0.741	0.303	.150	.015
ADHD diagnosis[a]	1.782	1.157	.132	.086	0.029	1.173	.002	.980	−0.138	0.327	−.026	.673
ASD diagnosis[a]	2.468	1.303	.181	.059	1.062	1.182	.086	.370	0.368	0.356	.063	.302
Emotional disorder diagnosis[a]	0.665	1.318	.053	.614	−0.410	1.196	−.036	.732	0.184	0.364	.035	.613
Baseline scores	0.327	0.073	.277	<.001	0.503	0.069	.477	<.001	0.424	0.064	.437	<.001
	SDQ conduct problems				SDQ hyperactivity				SDQ peer problems			
Age	−0.063	0.028	−.129	.023	−0.102	0.035	−.134	.003	−0.064	0.030	−.126	.033
Sex	−0.058	0.192	−.016	.763	−0.178	0.242	−.033	.461	0.402	0.211	.110	.058
ADHD diagnosis[a]	−0.374	0.214	−.099		0.265	0.298	.045	.363	−0.148	0.235	−.038	.585
ASD diagnosis[a]	−0.022	0.232	−.005		0.374	0.296	.058	.201	0.730	0.257	.168	.005
Emotional disorder diagnosis[a]	−0.110	0.220	−.029		0.197	0.279	.034	.478	−0.168	0.242	−.043	.489
Baseline scores	0.530	0.050	.572		0.714	0.049	.706	<.001	0.431	0.052	.472	<.001

Note. *B* = Unstandardized regression coefficient; SE_{β} = standard error of the coefficient; β = standardized coefficient.
[a]Diagnoses variables were not mutually exclusive such that an individual case may have any or all three.

The higher severity of the Australian children with ADHD and/or ASD at baseline compared to those in the Netherlands is consistent with CHQ treating only those with severe and complex problems and specifically for children with neurodevelopmental disorders, almost exclusively children with additional problems. This is consistent with their higher rates of co-morbidity, with 86% of the ADHD group having at least one additional diagnosis compared with only 50% of the Netherland's ADHD group. Those at CHQ also had higher comorbidity rates between ADHD, ASD, anxiety, and other developmental disorders compared with LUMC-Curium, while the rates at CHQ were consistent with previous research (Jensen & Steinhausen, 2015; Thapar & Cooper, 2016; Verkuijl et al., 2015).

An examination of the HoNOSCA items provides insight into how a diagnosis of ADHD and/or ASD, in addition to higher severity at beginning of treatment may contribute to worse outcomes. In both countries, at baseline, the ADHD and ASD groups had a higher proportion of children in the clinical range on items relating to over-activity and attention, while the emotional disorders group had a higher clinical proportion on the emotional symptoms item in both countries, a pattern that might be expected. However, at end

of treatment the group differences in clinical proportion remained for the core ADHD symptoms but had resolved for the emotional symptoms. To summarize, while treatment for emotional symptoms was as successful for children in the emotional disorders group as for children in the ADHD group, treatment for the core ADHD symptoms (such as overactivity and disruption) in children with ADHD was less successful in both countries.

Further work is needed to understand why in both countries such a high proportion of these children remain in the clinical range for core symptoms at end of treatment. As Figure 1 shows, treatment achieves a substantial reduction in symptom scores as expected given the results in treatment trials (Caye et al., 2019), but given the high level at baseline, the improvement is still not sufficient to reach the non-clinical range. This does not seem to be explained by less intense treatment or earlier disengagement as the median length of the treatment period was 63 (Australia) and 78 (the Netherlands) days longer for those with ADHD than those with emotional disorders. Given the improvement on emotional symptoms in the ADHD group, it could be that the focus of treatment is more on acceptance of the ADHD symptoms and reducing associated anxiety, depression, discouragement, and demoralization (Brown et al., 1988), rather than on maximally reducing ADHD symptoms. Unfortunately, the available data set did not contain information regarding treatment type (e.g., medication or behavioral interventions) so conclusions cannot be drawn. That a focus on ADHD symptoms may still be worthwhile is suggested by Coghill and Seth (2015) who showed a substantial and sustained reduction in ADHD symptom scores and a lower percentage of children scoring in the clinical range while on medication, after implementation of a standardized protocol of measurement-based care for assessment and treatment delivery.

Utilizing data from similar services across two different countries is a major strength of the study as results can be more readily generalized to similar services across the world. Further, both countries had similar baseline and end HoNOSCA-total scores for the emotional disorders group while results differed for the ADHD and ASD groups suggesting that those differences may result from differences in the way that ADHD and ASD are managed at health care system level rather than differences in the way clinicians in each country assess symptoms. A further strength of the study is considering those with ASD separately which eliminated a potential confound in our aim to compare outcomes for children with ADHD to those with other psychiatric diagnoses. This allowed for the pattern of results to emerge that clearly indicate it is those with neurodevelopmental diagnoses generally who do worse than those with other diagnoses. Another strength is the use of ROM which include items or subscales designed to assess both ADHD and emotional disorder symptoms allowing for an in-depth analysis of where group differences lie and where improvements to treatment might be made. This large-scale evaluation of Australian and Dutch outcomes also allows for greater generalizability than controlled, experimental trials. The use of an aggregation of emotional disorders might be considered a limitation of the study as the course of depression and anxiety can be somewhat heterogeneous (Beesdo-Baum & Knappe, 2012), however the number of cases within each separate diagnosis was too small to allow for meaningful comparisons. The use of real-world data also led to several limitations including missing and incomplete data. At both CHQ and LUMC-Curium training on the use of routine outcome measures is offered to all clinicians however completion rates were not available. Clinical practice also lacked any mechanism to check for or maintain fidelity and consistency across clinicians, clinics, or time. It would be beneficial to increase response rates for parental SDQ's in both countries. Finally, to achieve a large sample size, the analyses were restricted to data that were easily extractable from the electronic health records. To better understand why outpatient community treatment outcomes for those with ADHD are poorer than for those with emotional disorders the next step is to consider the specific treatment provided, evaluate how well it meets the current recommended guideline (National Institute for Health and Care Excellence, 2018) and consider if improvements could be made. Adherence to guidelines for the treatment of children with ADHD by General Practitioners and Paediatricians has been recently shown to be generally high (Ellis et al., 2021) however this is not necessarily generalizable to treatment at CHQ CYMHS or LUMC-Curium which is provided by other disciplines, psychologists and psychiatrists, and to more complex and severe cases, who often have not, or not sufficiently, responded to the initial treatment. Future research may specifically consider adherence to treatment guidelines in these cases where changing medication, for example, may be necessary to optimize treatment.

This study extends the previous research findings of poorer outcomes for those with ADHD compared to those with emotional disorders by showing that within two countries the poorer outcomes are mostly explained by higher severity at the beginning of treatment, that the core ADHD symptoms are more resistant to treatment than emotional symptoms, and that while substantial symptom reductions were achieved, the proportion of children with ADHD remaining in the clinical range at end of treatment is too high. Further, outcomes are similar for those with ASD indicating that it is those with neurodevelopmental disorders generally who achieve poorer outcomes. To better understand our results and optimize treatment, future research should look in more detail into the type of treatment provided at specialized mental health clinics and assess it against current guidelines.

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ORCID iDs

Leanne Payne https://orcid.org/0000-0002-7129-0258
Nardia Zendarski https://orcid.org/0000-0002-4498-0202
Matthew Bisset https://orcid.org/0000-0001-8757-4215
Emma Sciberras https://orcid.org/0000-0003-2812-303X

Supplemental Material

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Author Biographies

Leanne Payne is a research project coordinator for the Child Health Research Centre, The University of Queensland and the Service Evaluation and Research Coordinator at Jacaranda Place, a sub-acute inpatient facility that provides care to young people with complex and severe mental health difficulties.

Sanna L. Roest is a child and adolescent psychiatrist at Curium-LUMC with a keen interest in research into outcomes of children treated in child and youth mental health services.

Zhen Qi Lu is working as a junior doctor and aims to combine research with clinical practice.

Nardia Zendarski is a Research Fellow in the Department of Paediatrics, Melbourne Medical School, University of Melbourne.

Matthew Bisset is a clinical psychologist in the Psycho-Oncology Program, Children's Cancer Centre and a Research Associate at the Murdoch Children's Research Institute.

Emma Sciberras is Associate Professor, School of Psychology, Deakin University and co-leader Mental Health Care research, Centre for Social & Early Emotional Development, Deakin University.

Stephen Stathis a child and adolescent Psychiatrist and the Medical Director of Child and Youth Mental Health Services, Children's Health Queensland, Health and Hospital Service.

Bart M. Siebelink is a clinical psychologist at Curium-LUMC Centre of Child and Youth Psychiatry.

Robert R. J. M. Vermeiren is a professor of child and adolescent psychiatry and head patient care of Curium-LUMC.

Mark A. Bellgrove is Professor in Cognitive Neuroscience and Director of Research at the Turner Institute for Brain and Mental Health at Monash University. His work focuses on understanding the biology of attention in both health and disorder.

David Coghill is an academic child and adolescent psychiatrist based at the University of Melbourne departments of paediatrics and psychiatry with a main research focus on neurodevelopmental disorders in children and youth.

Christel M. Middeldorp has a conjoint appointment with the Child Health Research Centre (CHRC), UQ (Professor of Child and Youth Psychiatry), and Child and Youth Mental Health Service (CYMHS), Children's Health Queensland Hospital and Health Service (CHQ HHS). Her research interests involve the role of genetic and other familial influences on the development and persistence of psychopathology across the lifespan.