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SUPPLEMENT

Assessment of daily profiles of ADHD and ODD symptoms, and symptomatology related to ADHD medication, by parent and teacher ratings

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Abstract DAYAS is a new two-part rating scale that assesses: (1) ADHD and ODD symptoms (externalising symptom ratings) and (2) symptomatology potentially related to ADHD medication (potentially medication-related symptoms) in real-world settings at different time periods throughout a normal school day. Data from a proof-of-concept study and two observational trials (Medikinet® retard [methylphenidate] and the Equasym XL® [methylphenidate] OBSEER study) evaluated: (1) validity of weekly externalising symptom ratings using DAYAS, in place of daily ratings; (2) reliability and internal consistency of DAYAS ratings for externalising symptoms and potentially medication-related symptoms; and (3) convergent and divergent validity of the externalising symptom ratings with existing validated scales. From the proof-of-concept study, daily scores by period of day and during the whole day correlated strongly with equivalent weekly scores ($r = 0.83$–0.92). Internal consistency of externalising symptom rating scales calculated from pooled data were acceptable or good by period of day (Cronbach's alpha = 0.68–0.90) and very high for whole day scores (Cronbach's alpha = 0.88–0.95). Internal consistency of the rating scale for potentially medication-related symptoms was also good for both teacher and parent ratings. From OBSEER data, correlations between FBB-ADHD total symptom scores and ratings on both parent and teacher versions of DAYAS were high ($r = 0.73$ and $r = 0.84$, respectively). Correlations between DAYAS and SDQ were highest for the SDQ subscales *hyperactivity* and *conduct problems* and substantially lower for *pro-social behaviour*, *peers* and *emotional problems*. The DAYAS rating scale had good internal consistency, and DAYAS scores correlated well with existing validated scales and the SDQ subscales *hyperactivity* and *conduct problems*. Weekly DAYAS scores (whole day and by period of day) could be considered a suitable replacement for daily assessment scores.

Keywords ADHD · Parent report · Teacher report · Screening instrument · Oppositional defiant disorder

Introduction

Attention deficit hyperactivity disorder (ADHD) affects over 5% of children worldwide and is the most commonly diagnosed childhood neurobehavioural disorder [19]. Treatments for ADHD include stimulants, such as methylphenidate (MPH), which provide a rapid and dramatic improvement of both behaviour and ADHD symptoms in affected children [1]. However, MPH is quickly metabolised to an inactive form, with a half-life in the body of 2–4 h and, therefore, a short duration of action [15]. Thus, MPH needs to be taken repeatedly throughout the day in order to maintain efficacy, and this can lead to adherence issues and additional complications if the drug needs to be taken during school hours [16]. Long-acting formulations of MPH combining both immediate release (IR) and

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extended release (ER) components are now available that avoid the need for additional doses during the day, while still maintaining a rapid onset of therapeutic effect [13, 18].

Several well-designed and evaluated rating scales to assess ADHD symptoms as perceived by parents or teachers exist and have been used both in research assessing the effects of pharmacotherapy or psychotherapy (e.g. Multisite Treatment Study of ADHD [MTA] [17]) and in clinical practice. Well-known examples of such scales include the SNAP Checklist (Swanson) [21], ADHD rating scale [11], Conners' rating scales [3] and FBB-ADHD (Fremdbeurteilungsbogen für hyperkinetische Störungen), a German rating scale based on the International Classification of Disease, 10th revision (ICD-10) and Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV) [2, 12]. However, these rating scales assess ADHD symptoms globally, usually over several weeks, and do not distinguish between symptoms during different periods of the day or in different situations. They cannot, therefore, take account of the fact that ADHD symptoms may fluctuate throughout the day and even from one situation to another. With the development of ER preparations with different durations of action, rating scales that can assess ADHD symptoms at different periods of the day, and thus assess the duration of the action, are required. This is becoming increasingly important to both research and clinical practice.

Previous attempts to assess the duration of action of a given preparation, or to compare different preparations, have involved laboratory school or classroom analogue studies. Patients were observed every 2–3 h while doing maths tests and assessed with the Swanson, Kotkin, Agler, M-Flynn and Pelham (SKAMP) rating scale [8, 22], designed specifically to measure classroom aspects of ADHD. However, these studies assess behaviour and medication effects in arbitrary laboratory situations, which may not accurately reflect real-world settings. Laboratory assessments are also very time-consuming, making them impractical for large-scale assessment of medication or assessment of the duration of action in an individual titration procedure as is necessary at the start of the treatment.

There is, therefore, a need for an easy-to-administer instrument that could be used to assess ADHD symptoms over different periods during a normal school day. Such an instrument would need to be sensitive to change and able to assess both treatment effects of medication and the duration of these effects; the most frequent side effects of medication would also need to be assessed. In order to cover a normal school day, both parent and teacher ratings need to be included.

The Day Profile of ADHD Symptoms (DAYAS) is a translation of the German ADHS-Tagesprofilbogen [5] (Supplementary material). DAYAS assesses the daily profile of ADHD and other externalising symptoms from early morning until bedtime. DAYAS also incorporates an evaluation of oppositional defiant disorder (ODD), the most common coexisting behavioural problem in children with ADHD. A teacher version of the questionnaire (DAYAS-T) considers the first and second part of the morning at school (in Germany, children usually attend school only in the morning). This complements the parent version (DAYAS-P), which covers the remaining four daily periods: early morning (before school), early afternoon until 4.00 pm, late afternoon until 7.00 pm and evening. The rating scale evaluates six items: (1) hyperactivity, (2) inattention, (3) impulsivity, (4) oppositional behaviour, (5) aggressive behaviour and temper tantrums and (6) a global rating of problem behaviour. A subscale, *ADHD symptoms*, is comprised of items 1–3, and items 4 and 5 are combined into a second subscale, *ODD symptoms*. For each period, parents and teachers rate each item on a four-point scale using the following values: 0 = not at all; 1 = just a little; 2 = pretty much; 3 = very much. The total score is the sum of the six item scores per time period divided by the number of items. Ratings are intended to reflect the behaviour of the child at the different time periods of the day.

The second part of both DAYAS-P and DAYAS-T assesses potential adverse effects of pharmacotherapy in 11 items and 9 items, respectively. These items were adapted from the Pittsburgh Side-Effects Rating, as previously used in the MTA [4, 17]. Pharmacotherapy-related items were assessed not for each period of the day but for the whole observation time (usually the last week).

The aims of this post hoc analysis are to assess:

1. the validity of weekly externalising symptom ratings using DAYAS in place of daily ratings;
2. the internal consistency of the DAYAS externalising symptom ratings and the ratings of potentially medication-related symptoms; and
3. the convergent and divergent validity of the externalising symptom ratings by analysing correlations with other rating scales of ADHD, ODD and emotional problems.

Methods

Participants and measures

Study 1: Proof-of-concept study, daily versus weekly ratings with DAYAS and convergent validity

In a pilot study [23], 27 children were recruited (mean age = 9.8 years, standard deviation [SD] = 1.4; 21 males; 59% receiving medication for ADHD) from an outpatient unit with a diagnosis of ADHD (ICD-10 diagnoses: F90.0,

70%; F90.1, 26%; F90.9, 4%). Telephone assessment was used to evaluate validity and reliability of the parent and teacher rating scales (DAYAS-P/-T) for daily or weekly evaluation of ADHD and ODD core symptoms (externalising symptoms). The study also examined whether daily assessments of externalising symptoms could be replaced by weekly ratings. A weekly rating of externalising symptoms was collected for both DAYAS-P and DAYAS-T in Week 1 and Week 2. Additionally, during Week 2, daily ratings from Monday to Friday were collected. Parents and teachers were also asked to rate ADHD and ODD symptoms, according to DSM-IV and ICD-10, using the FBB-ADHD and FBB-ODD checklists [9, 12].

Study 2: Psychometrics (Medikinet® retard observational study)

The Medikinet® retard observational study [7] recruited children and adolescents aged 6–17 years with a diagnosis of ADHD for whom titration of, or change to, Medikinet® retard/XL (long-acting MPH with 50% MPH-IR; Medice, Germany) was planned and who had no contraindications to this therapy. Data for 467 patients were collected, and data from 447 patients were included in an intent-to-treat analysis. Primary outcome measures were ADHD severity and side effects rated by physicians and parents, both at the start of the medication switch and 4–6 weeks later. At each assessment, teachers and parents were asked to complete the weekly DAYAS to evaluate behavioural problems and ADHD symptoms. Efficacy was also assessed by physicians using the clinical global impression (CGI) severity scale (ADHD-CGI–S).

Study 3: Psychometrics (OBSEER study)

OBSEER (OBservation of Safety and Effectiveness of Equasym XL® in Routine care) [6] was an open-label, prospective, non-controlled, observational post-marketing surveillance study conducted in Germany in accordance with local regulations and under the therapeutic responsibility of the attending physicians; ethics or institutional review board approval was not required for this study. The study enrolled 852 patients aged 6–17 years and evaluable data were obtained for 822 patients. Eligible patients had a diagnosis of ADHD, were about to commence treatment with Equasym XL®[1] (modified-release MPH formulation with 30% MPH-IR and 70% MPH-ER; Shire Pharmaceuticals Ireland Limited, Ireland) and were attending school. Exclusion criteria were the presence of any of the contraindications listed in the summary of product characteristics or a mental handicap. Assessments were carried out at baseline, after 1–3 weeks of treatment and after 6–12 weeks of treatment. At each assessment, teachers and parents were asked to complete questionnaires (strengths and difficulties questionnaire [SDQ-P; 14, 20], FBB-ADHD and DAYAS) to evaluate behavioural problems and ADHD symptoms. Efficacy was assessed by physicians using the CGI–S and improvement scales (CGI–I).

Statistical analyses

Pearson correlations were calculated to assess the validity of weekly DAYAS ratings compared with daily DAYAS ratings and to assess the convergent validity of the DAYAS scales with other rating scales of ADHD and ODD. Internal consistency was assessed by calculating Cronbach's alpha. Additionally, part-whole corrected correlations were calculated to assess the correlation between item scores and scale scores. Stepwise regression analyses were conducted to analyse the multiple correlations between the different DAYAS scores and the FBB-ADHD scores.

Results

Assessing the validity of the weekly rating compared with the daily rating, and convergent validity of externalising symptom ratings: study 1 data

Correlations between mean daily ratings and weekly ratings on the DAYAS total score from the proof-of-concept study are shown in Table 1. As expected, mean daily ratings from Week 2 showed higher correlation with the weekly ratings for the same week (correlation range by period: 0.83–0.92) than with the weekly ratings for Week 1 (correlation range by period: 0.56–0.76). Test–retest reliability of weekly ratings between Week 1 and Week 2 gave a correlation value of $r = 0.69$ for DAYAS-P total score for the whole day (the sum of the four daily periods rated by the parents) and $r = 0.74$ for DAYAS-T total score for the whole day (the sum of both daily periods rated by the teachers).

To assess convergent validity, correlations were calculated between the DAYAS total scores for the whole day and ratings on the FBB-ADHD and FBB-ODD. The DAYAS-P ratings (total scores, whole day) gave a correlation of $r = 0.52$ with the parent-rated FBB-ADHD total score and $r = 0.56$ with the parent-rated FBB-ODD total score. Thus, the DAYAS-P total score reflected both ADHD and

[1] Equasym XL is the UK trade name, and is registered and marketed by Shire in the following countries under the following trademarks: Denmark, Equasym Depot; Finland, Equasym Retard; France, Quasym LP; Germany, Equasym Retard; Ireland, Equasym XL; Netherlands, Equasym XL; Norway, Equasym Depot; Sweden, Equasym Depot; South Korea, Metadate CD; Mexico, Metadate CD. Information correct at August 2011.

Table 1 Pearson correlations between daily ratings and weekly ratings of externalising symptoms on the DAYAS total score, from a proof-of-concept study [23]

	Correlation of mean daily rating in Week 2 with weekly rating in Week 1 and range of correlations (in parentheses)	Correlation of mean daily rating in Week 2 with weekly rating in Week 2 and range of correlations (in parentheses)
Early morning (DAYAS-P)	0.56 (0.31–0.56)	0.92 (0.63–0.88)
First half of school morning (DAYAS-T)	0.76 (0.32–0.76)	0.84 (0.40–0.81)
Second half of school morning (DAYAS-T)	0.60 (0.30–0.63)	0.85 (0.55–0.75)
Early afternoon (DAYAS-P)	0.68 (0.40–0.53)	0.86 (0.27–0.86)
Late afternoon (DAYAS-P)	0.62 (0.37–0.57)	0.83 (0.44–0.77)
Evening (DAYAS-P)	0.62 (0.36–0.55)	0.86 (0.54–0.71)

DAYAS Day Profile of ADHD Symptoms, *DAYAS-P* parent-rated DAYAS, *DAYAS-T* teacher-rated DAYAS

ODD symptoms. The DAYAS-T ratings (total scores, whole day) correlated well ($r = 0.85$) with the teacher-rated FBB-ADHD total score and to a lesser extent ($r = 0.37$) with the teacher-rated FBB-ODD total score. Thus, the DAYAS-T total score reflected ADHD symptoms to a higher degree than ODD symptoms.

Assessment of internal consistency: pooled data from studies 2 and 3

Internal consistency was initially analysed in the Medikinet® retard observational study (study 2) and the OBSEER (study 3) samples separately. Only minimal differences in Cronbach's alpha and in the part-whole correlations in the two samples were found. A combined sample from the two studies gave a total analysis population of 1,269 children (81.1% boys) aged 6–17 years (mean [SD] 10.27 [2.50]). All children were attending school (54.1% attended primary school; 30.5% attended secondary school [Hauptschule, 10.2%; Realschule, 13.1%; Gymnasium, 7.2%] and 6.4% attended special schools for children with learning difficulties or behavioural problems). Children in the combined sample were diagnosed as having: hyperkinetic disorder (F90.0, 52.9%), hyperkinetic conduct disorder (F90.1, 36.0%) or a non-specified hyperkinetic disorder (11.1%) according to ICD-10 criteria.

The internal consistencies (Cronbach's alpha) of the DAYAS-P and DAYAS-T externalising symptom scales and the potentially medication-related symptoms scales in the combined sample at baseline are given in Table 2. Despite the fact that the externalising symptom scales *ODD*, *ADHD* and *Total* include only a few items (two, three and six items, respectively), the internal consistencies were acceptable or good for both DAYAS-P and DAYAS-T with a range of Cronbach's alpha = 0.68–0.95. The potentially medication-related symptoms scales (containing 9 or 11 items in DAYAS-T and DAYAS-P, respectively) were also in an acceptable range (Cronbach's alpha = 0.73–0.81). Table 2 includes all parent ratings of ADHD and ODD by period and also the total scores for all four periods of the day (whole day parent), the equivalent for both teacher-rated periods (whole day teacher) and the combined parent and teacher ratings. Internal consistencies of these whole day scores were very high (Cronbach's alpha = 0.88–0.95), with part-whole correlations of $r = 0.40$ or higher. These correlations indicate that the ratings of the different daily periods are quite homogenous—i.e. that patients with high ratings in the morning also have high ratings in the evening—and therefore have a similar contribution to the total scores.

Figure 1 shows the day profile of the parent and teacher externalising symptoms ratings in the combined Medikinet® retard observational study and the OBSEER sample, excluding cases with missing values ($n = 632$ for ADHD and $n = 649$ for ODD symptom scores). The total means (i.e. means across all daily ratings) for ADHD and ODD ratings and the corresponding 95% confidence intervals are shown as horizontal bars in Fig. 1.

The highest symptom ratings for both ADHD and ODD were found in the late afternoon, while the lowest ratings were found in the first part of the school morning, possibly reflecting the fact that many patients were already receiving medication at baseline, which may have its main effect in the first half of the school morning.

In the OBSEER study, correlations between the assessments at the first and the second visit on the subscale *ADHD* (*ODD* subscale) were $r = 0.51$ ($r = 0.52$) for parent ratings, early afternoon and $r = 0.62$ ($r = 0.65$) for teacher ratings, first half of the school morning, indicating a moderate stability even during the medication switch. Similar stability coefficients were found for the Medikinet® retard observational study.

Assessment of convergent and divergent validity: study 3 data

Using baseline data from the OBSEER study, bi variate Pearson correlations were calculated to evaluate

Table 2 Internal consistencies (Cronbach's alpha) of DAYAS-P/-T scales in the combined study sample at baseline

Time		*N*	Items	Cronbach's alpha	Part-whole correlations range	
Parent rating (*DAYAS-P*)						
Early morning	Total	1,074	6	0.88	0.64	0.79
	ADHD	1,097	3	0.80	0.59	0.68
	ODD	1,105	2	0.71	0.55	0.55
Early afternoon	Total	1,045	6	0.87	0.61	0.78
	ADHD	1,075	3	0.78	0.56	0.65
	ODD	1,080	2	0.68	0.51	0.51
Late afternoon	Total	1,051	6	0.87	0.58	0.79
	ADHD	1,085	3	0.77	0.55	0.63
	ODD	1,095	2	0.69	0.54	0.54
Evening	Total	1,050	6	0.89	0.65	0.82
	ADHD	1,082	3	0.81	0.63	0.67
	ODD	1,090	2	0.72	0.56	0.56
Whole day	Total	1,001	24	0.95	0.45	0.75
	ADHD	1,043	12	0.90	0.45	0.74
	ODD	1,056	8	0.91	0.63	0.77
	PMRS	1,073	11	0.73	0.21	0.50
Teacher rating (*DAYAS-T*)						
Morning, first half	Total	749	6	0.89	0.62	0.82
	ADHD	762	3	0.80	0.56	0.69
	ODD	764	2	0.74	0.58	0.58
Morning, second half	Total	714	6	0.90	0.63	0.83
	ADHD	730	3	0.81	0.57	0.73
	ODD	740	2	0.76	0.61	0.61
Whole day	Total	711	12	0.94	0.59	0.83
	ADHD	728	6	0.89	0.57	0.77
	ODD	736	4	0.88	0.73	0.75
	PMRS	732	9	0.81	0.44	0.60
Parent and teacher rating (*DAYAS-P + T*)						
Whole day	Total	594	36	0.95	0.42	0.69
	ADHD	632	18	0.90	0.40	0.69
	ODD	649	12	0.89	0.50	0.71

ADHD attention deficit hyperactivity disorder, *DAYAS* Day Profile of ADHD Symptoms, *DAYAS-P* parent-rated DAYAS, *DAYAS-T* teacher-rated DAYAS, *ODD* oppositional defiant disorder, *PMRS* potentially medication-related symptoms

convergent validity between DAYAS externalising scores and ratings of ADHD symptoms and impairment as assessed by parents and teachers with the FBB-ADHD. The highest correlations for FBB-ADHD symptoms and FBB-ADHD impairment ratings by parents were found with the early afternoon and in late afternoon parent ratings on the DAYAS scale (Table 3). However, teacher ratings on the DAYAS scale also had substantial positive correlations with the FBB-ADHD parent ratings. Similarly, the highest correlations with the FBB-ADHD teacher ratings were found for DAYAS-T, but substantial correlations with DAYAS-P were also seen.

Stepwise regression analyses with the four DAYAS-P ADHD scores (early morning, early afternoon, late afternoon, evening) as predictors and parent-rated FBB-ADHD total symptom scores as criterion ($n = 640$) indicated that all parent-rated DAYAS ADHD scores had a significant contribution to the multiple correlation of $R = 0.73$; 53% of the variance (corrected R^2) of the FBB-ADHD scores could be explained by variation of the DAYAS-P ADHD scores at the different phases across the day. Similar stepwise regression analyses with the two DAYAS-T ADHD scores (first and second half of school morning) as predictors and the teacher-rated FBB-ADHD total symptom score as criterion ($n = 516$) revealed that both DAYAS-T ADHD scores had a significant contribution to the multiple correlation of $R = 0.84$; 70% of the variance (corrected R^2) of the FBB-ADHD scores could be explained by variation of the two teacher-rated ADHD scores across the school morning.

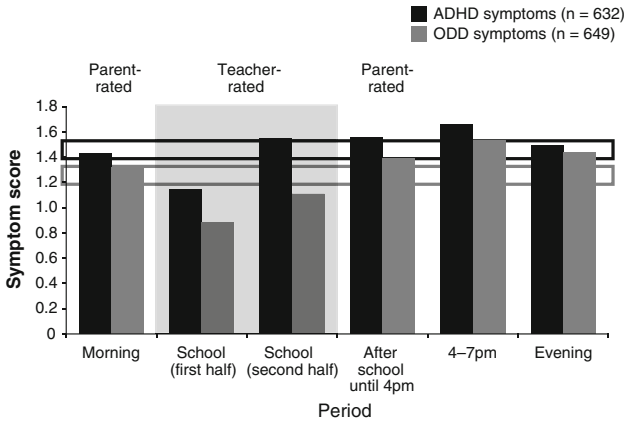

Fig. 1 DAYAS-P and DAYAS-T ratings in the combined sample. Cases with missing values are excluded. *Black* and *grey horizontal bars* represent the means with 95% confidence intervals across all daily ADHD (*black*) and ODD (*grey*) ratings, respectively. *ADHD* attention deficit hyperactivity disorder, *ODD* oppositional defiant disorder

Convergent and divergent validity was assessed by correlating DAYAS scores with parent ratings on the SDQ in the OBSEER study (Table 4). As expected, DAYAS ADHD and ODD ratings had the highest correlations with the SDQ ratings of *hyperactivity* and *conduct problems*; correlations with *pro-social behaviour*, *peers* and *emotional problems* were substantially lower.

Discussion

We analysed data from a proof-of-concept study, and two observational trials, the OBSEER Equasym XL® study, and a study of Medikinet® retard, to show that the DAYAS rating scale is a reliable and practical tool for assessing ADHD and ODD symptoms across the day in real-world settings.

Analyses of data from the proof-of-concept study show that correlations between weekly and daily ratings of

Table 3 Pearson correlations between DAYAS externalising symptom scores and FBB-ADHD symptoms and impairment ratings at baseline in the OBSEER study

DAYAS Day Profile of ADHD Symptoms, *FBB-ADHD* Fremdbeurteilungsbogen für hyperkinetische Störungen

DAYAS score	FBB-ADHD symptoms total parent score	FBB-ADHD impairment parent score	FBB-ADHD symptoms total teacher score	FBB-ADHD impairment teacher score
Early morning (parent)	0.42	0.32	0.23	0.14
School morning first half (teacher)	0.37	0.30	0.76	0.69
School morning second half (teacher)	0.39	0.29	0.82	0.74
Early afternoon (parent)	0.68	0.55	0.35	0.33
Late afternoon (parent)	0.63	0.48	0.30	0.24
Evening (parent)	0.48	0.37	0.18	0.12

Table 4 Pearson correlations of DAYAS-P and DAYAS-T externalising subscale ratings with SDQ subscale and total scores from the OBSEER study

DAYAS		SDQ					
Time (assessor)	Subscale	Pro-social	Peer	Hyperactivity	Conduct	Emotion	Total
Early morning (parent)	ADHD	−0.22	0.19	0.33	0.33	0.02	0.26
	ODD	−0.33	0.27	0.32	0.54	0.09	0.36
School morning first half (teacher)	ADHD	−0.13	0.17	0.29	0.26	−0.12	0.18
	ODD	−0.25	0.27	0.24	0.37	−0.09	0.22
School morning second half (teacher)	ADHD	−0.10	0.13	0.34	0.31	−0.10	0.22
	ODD	−0.23	0.25	0.22	0.39	−0.08	0.22
Afternoon (parent)	ADHD	−0.22	0.20	0.57	0.44	0.12	0.43
	ODD	−0.35	0.27	0.41	0.63	0.14	0.44
Late afternoon (parent)	ADHD	−0.20	0.19	0.52	0.44	0.11	0.41
	ODD	−0.32	0.26	0.40	0.62	0.13	0.44
Evening (parent)	ADHD	−0.17	0.20	0.37	0.38	0.12	0.36
	ODD	−0.30	0.25	0.34	0.55	0.15	0.40

ADHD attention deficit hyperactivity disorder, *DAYAS* Day Profile of ADHD Symptoms, *ODD*, oppositional defiant disorder, *SDQ* Strengths and Difficulties Questionnaire

externalising symptoms were sufficiently high enough to indicate that weekly ratings can be substituted for daily ratings. This may help to reduce the burden of assessments on parents, teachers and healthcare professionals. It should be noted, however, that the same-week correlations may overestimate the true correlation, as the rating of each single day may have increased the correspondence with the weekly rating. However, in contrast, correlation values between Week 1 and Week 2 may underestimate the true correlation of the test, as behaviour may have changed over the 2 weeks.

DAYAS rated weekly (including DAYAS-P and DAYAS-T for both externalising symptoms and potentially medication-related symptoms) has satisfactory reliability, as assessed by internal consistency or test–retest stability. The high correlations of the externalising symptoms ratings at different periods during the day with a total score across all periods indicate that the ratings of the different daily periods were quite homogenous; patients with a high rating in the morning had a high rating in the evening and, therefore, had a consistent contribution to the total scores.

While convergent validity was seen between DAYAS externalising symptoms ratings and the FBB-ODD, FBB-ADHD and the SDQ subscales *hyperactivity* and *conduct problems*, substantially lower correlations for the subscales *pro-social behaviour*, *peers* and *emotional problems* are indicative of the divergent validity of the DAYAS scores. DAYAS ADHD ratings accounted for 53% (parents) and 70% (teachers) of the ratings of ADHD according to DSM-IV and ICD-10, which demonstrates a high convergent validity. We believe these findings demonstrate the usefulness of DAYAS as a screening instrument and validate it for use in ADHD. Moreover, two observational studies, the OBSEER study [6] and the Medikinet® retard observational study [7], and one randomized controlled trial [10] demonstrate that changes in ADHD symptoms and ODD symptoms during the switch of medication can be detected with DAYAS. Thus, the sensitivity of the DAYAS scale to change was also demonstrated. Therefore, we believe that DAYAS is a helpful tool for clinical practice and research to detect ADHD and ODD symptoms at different periods during the day and to detect changes in ADHD/ODD symptoms at different periods across the days. This may be helpful in optimising medication effects across the day.

The potentially medication-related symptoms part of both DAYAS-P and DAYAS-T has a good internal consistency, despite the fact that the symptoms considered on this scale were heterogeneous. This suggests that this scale can be used to assess reliably the most frequently observed side effects of ADHD medication. In addition to being caused by ADHD medication, such symptoms can also be comorbid symptoms of ADHD itself. Thus, an assessment prior to starting medication may be useful for disentangling side effects from comorbidity. DAYAS enables a simple assessment of these symptoms using both parent and teacher ratings.

In conclusion, these analyses show that DAYAS has satisfactory reliability and validity, is sensitive towards change, and, with the option of rating weekly instead of daily, is feasible in routine care.

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Conflict of interest Dieter Breuer has been a consultant for Lilly, Shire Pharmaceuticals Ltd, UCB and Medice. Anja Görtz-Dorten has no conflict of interest. Aribert Rothenberger has acted as a consultant or on advisory boards and/or as a speaker for Lilly, Shire Pharmaceuticals Ltd, Medice, Novartis and UCB. He has received research support from Shire Pharmaceuticals Ltd, the German Research Society and Schwaabe, and travel and educational grants from Shire Pharmaceuticals Ltd. Manfred Döpfner has received research grants and/or acted as a consultant or on advisory boards for Lilly, Shire Pharmaceuticals Ltd, Medice and Vifor.

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