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Psychometric properties of a modified version of the Weiss Functional Impairment Rating Scale-Parent Report (WFIRS-P) in a clinical sample of children with aggressive behavior

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Abstract

Purpose To evaluate the psychometric properties of a German modification of the Weiss Functional Impairment Rating Scale—Parent Report for children with aggressive and oppositional behavior problems (WFIRS-P for ODD/CD).

Methods Data were collected from a clinical sample of children (6–12 years; 96% boys) with oppositional defiant disorder (ODD) and conduct disorder (CD) ($N = 219$). The WFIRS-P conceptual framework was evaluated using confirmatory factor analyses (CFA). Reliability was estimated using internal consistency (Cronbach's alpha) and omega statistics. Validity was assessed through correlations between WFIRS-P for ODD/CD domain scores and parent-rated scales on symptoms of ODD, CD, attention-deficit/hyperactivity disorder (ADHD), a broad range of other behavioral and emotional problems, and scales on health-related quality of life and family burden.

Results CFA of the WFIRS-P for ODD/CD revealed that a bifactor model, with a general factor accounting for common variance ($\omega_H = 0.23$–0.48) and independent specific group factors accounting for additional variance in item scores ($\omega_S = 0.37$–0.60), best fits the data. Thus, CFA confirmed the theoretical assumption of a general construct of impairment (total scale) and additional specific impairments (subscales, e.g., family, social activities). Cronbach's alpha coefficient exceeded 0.70 for all subscales. Omega statistics showed that both the general construct and specific factors accounted for item variance. As expected, correlations with symptoms scales for ODD/CD and ADHD were low to moderate.

Conclusions The use of the parent-rated WFIRS for ODD/CD in identifying ODD- and CD-related impairment in children is psychometrically supported. The scale can be employed to assess functional impairment in children with aggressive behavior problems.

Keywords Oppositional defiant disorder · Children · Functional impairment · Weiss Functional Impairment Rating Scale · Psychometric properties

Introduction

Aggressive and oppositional behavior problems are seen frequently in childhood and adolescence, with prevalence rates ranging from 1 to 11% for oppositional defiant disorder (ODD) and from 2 to 10% for conduct disorder (CD) with higher prevalence rates in boys than in girls (1,4 to 1) [1]. Typically, ODD is characterized by a persistent pattern of irritability, angry mood, defiant disorder, or vindictiveness while CD descripts a repetitive and persistent pattern of violating the basic rights of others or major age-appropriate societal norms or rules. Both ODD and CD often co-occur with attention-deficit/hyperactivity disorder (ADHD) that is defined by symptoms of inattention and hyperactivity-impulsivity. According to the diagnostic and statistical manual of mental disorders [1], ODD and CD are diagnosed only if symptoms cause functional impairment. The latter may be defined as having considerable difficulties in handling important daily life activities [2, 3].

Compared to psychiatric comparison, subjects and peers without symptomatic CD/ODD children with symptoms of

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ODD/CD are more likely to display impairment in several domains. They have been reported to experience more negative peer interactions [4–6], spare-time problems [4], and peer rejection [7], and to show inferior functioning in school settings and higher rates of school failure [4]. Moreover, ODD/CD symptoms have been related to family dysfunction, family conflicts, weaker family cohesion and problems with siblings [4]. Thus, impairments associated with ODD/CD are pervasive across multiple domains and types of social interactions.

Symptoms and functional impairment are often interrelated, but can be empirically disentangled. Studies assessing this relationship have indicated positive moderate correlations between impairment and symptoms [8–10]. For example, Pickles et al. [11] reported a correlation of $r = .53$ between symptoms of ODD and psychosocial impairment and a correlation of $r = .40$ between symptoms of CD and psychosocial impairment. This lack of a perfect relationship between symptoms and impairment indicates that measures of impairment provide additional information to measures of symptoms [10]. In line with this, some children meet symptom-based criteria for a diagnosis, but do not show considerable levels of functional impairment, while others are significantly impaired, but do not reach the symptomatic threshold for a given disorder. Here, Pickles et al. [11] found that the prevalence of ODD/CD decreased markedly when diagnostic decisions were based not only on symptom criteria but also on the level of impairment. Hence, besides its usefulness for verifying the need for treatment, the assessment of functional impairment also seems to be relevant for treatment planning, the identification of maintaining factors and treatment targets, and the measurement of treatment success [12, 13].

For the assessment of functional impairment in children and adolescents with ODD/CD, diagnosis-specific impairment measures are lacking. Studies that examined functional impairment in ODD/CD predominantly used global impairment measures [4] or a multitude of different questionnaires for different aspects of functional impairment [14]. In contrast, much effort has been devoted to developing diagnosis-specific measures of impairment ADHD [15]. In research and practice, one widely used instrument to evaluate functioning in children with ADHD is the Weiss Functional Impairment Rating Scale (WFIRS) [16]. The scale is available in a self-report (WFIRS-S) and a parent-report (WFIRS-P) version and evaluates functioning in the following domains: family, learning and school, life skills, child's self-concept, social activities, and risky activities.

Dose et al. [17] examined a German adaptation of the WFIRS-P in a clinical sample of children with externalizing disorders (ADHD and/or ODD). Their results supported the psychometric quality of the WFIRS-P for this sample and thus appear to extend the applicability of the WFIRS-P to the assessment of impairment in externalizing disorders in general. However, since the analysis was based on a sample of children with mainly ADHD and only partly ODD, there is a clear need to re-examine the psychometric properties of the WFIRS-P by focusing on children with aggressive and oppositional behavior problems in order to extend the applicability of this questionnaire to ODD/CD.

Accordingly, the objective of this study was to evaluate the psychometric properties of a German adaptation of the WFIRS-P in a larger sample of children with a diagnosis of ODD/CD (WFIRS-P for ODD/CD). The following research questions were addressed:

1. Does the collected data of the WFIRS-P for ODD/CD fit appropriately to the originally identified domains of the WFIRS-P for ADHD? Moreover, are the data potentially congruent with a hierarchical structure model that identifies a general factor of functional impairment in addition to the different domains of impairment?
2. Is the questionnaire able to measure the domains in a reliable way?
3. Is the WFIRS-P a valid instrument to assess functional impairment in children with aggressive behavior problems? Is there a valid association with measures of ODD/CD symptoms, comorbid symptoms, health-related quality of life, and family burden?

Methods

The data reported in the current paper were collected between 2009 and 2016 in the course of two clinical trials that examined the efficacy of two social skills training programs for 6–12-year-old children with peer-related aggressive behavior: The Treatment Program for Children with Aggressive Behavior (THAV) [18–20] and the computer-based Treatment Program for Children with Aggressive Behavior (ScouT) [21]. Both studies were registered at ClinicalTrials.gov (identifier study 1: NCT01406067; identifier study 2: NCT02143427) and approved by the Medical Ethics Committee of the University Hospital of Cologne. For both studies, children were eligible if they were aged 6–12 years, had an IQ $\geq$ 80 , and met the criteria for an ICD-10 diagnosis of CD (F91), mixed disorder of conduct and emotions (F92), or hyperkinetic conduct disorder (F90.1). Moreover, eligible children showed peer-related aggressive behavior causing persistent impairment of relationships with other children at pre-assessment immediately before the start of the treatment phase. Exclusion criteria were a primary comorbid disorder according to clinical judgment (e.g., autism), a planned change of medication in children receiving psychotropic medication, and psychotherapy of the child other than the study treatment. Further, in THAV

only boys were included, because the majority of patients with (peer-related) overt aggressive behavior are boys while girls more often use relational aggression [22]. For detailed information, see [18–21].

Study data

In the first study (THAV), data were collected from 101 boys aged 6–12 years ($M = 8.79$; SD = 1.86). In the second study (ScouT), data were available from 118 children aged 6–12 years ($M = 9.16$, SD = 1.79; 93% boys). Thus, the total sample comprised 219 children with a mean age of 8.99 years (SD = 1.83). A percentage of 71% of these children met the ICD-10 criteria [23] for oppositional defiant disorder (F91.2), 17% for hyperkinetic conduct disorder (F90.1), 10% for conduct disorder (F91.1; F91.2), 1% for mixed disorders of conduct and emotions (F92.8), and 1% for conduct disorder, unspecified (F91.9) based on the DCL-SSV [24].

Measures

The *WFIRS-P* [16] is a parent-rated questionnaire which was originally designed to assess functional impairment in different domains in children diagnosed with ADHD. The original version of the WFIRS-P contains 50 items that can be aggregated to six subscales: Family (e.g., makes it hard for the family to have fun together), school (e.g., receives grades that are not as good as his/her ability), life skills (e.g., problems getting ready for school), child's self-concept (e.g., my child does not have enough fun), social activities (e.g., teases or bullies other children), and risky activities (e.g., breaking or damaging things). In clinical samples of children with ADHD, the structure of the scale was confirmed by confirmatory factor analysis (CFA) [16, 17, 25–27]. Some studies demonstrated that the model fit improves when the items of the school scale are modeled as two distinct concepts: learning and school behavior [16, 25]. All of the scales demonstrated good reliability [16, 17, 25–27].

For the purpose of this study and in order to reduce response burden, the translated version of the original questionnaire by Dose et al. [17] was shortened. First, we excluded the scale assessing Risky Activities and the scale assessing the Child's Self-Concept, as, in our opinion, these scales cover symptoms of disruptive behavior disorders and comorbid depression rather than functional impairment. Further, we reduced the scale Family from 10 to 5 items. Here items were excluded because of low factor loadings [17] ('Isolating the family from friends'; 'Costs the family extra money'), low clinical importance rated by two independent clinicians ('Takes time away from family members, work or activities'; 'Makes it hard to give fair attention to all family members'), or because they describe symptoms of aggression ('Causing fighting in the family'). Lastly, the scale Learning and School was shortened by the item 'Receives detentions during or after school,' since detentions are not common in German primary schools. The remaining 31 items were rated on a four-point Likert scale ranging from 0 ("never or not at all") to 3 ("very often or very much"), with higher scores indicating higher impairment. Subscale scores (family, school behavior, learning, life skills, social activities) and a total score were computed by averaging the associated item scores [16].

The Symptom Checklist for Oppositional Defiant Disorder and Conduct Disorder (*FBB-SSV*) *parent rating* [24] is part of the German Diagnostic System (DISYPS-II) and measures symptoms of ODD and CD according to DSM-IV and ICD-10. The parent-report questionnaire comprises 25 items (e.g., is irritable) that are rated with regard to their severity on a four-point Likert scale ranging from 0 ("not at all") to 3 ("very much"); higher scores indicating a higher degree of symptoms. Items can be aggregated to two subscales (oppositional behavior and antisocial behavior) and to a total score by averaging the associated item scores. All subscale scores and the FBB-SSV total score have shown satisfactory internal consistency ($\alpha = 0.71$–0.93) and factorial validity [24].

The *Symptom Checklist for Attention-Deficit/Hyperactivity Disorder* (*FBB-ADHS*); *parent rating* [24] is part of the DISYPS-II and measures symptoms of ADHD according to DSM-IV and ICD-10. It consists of 20 items (e.g., has problems in organizing tasks or activities) that are rated with regard to their severity on a four-point Likert scale ranging from 0 ("not at all") to 3 ("very much"); higher scores indicating a higher degree of symptoms. Items can be aggregated to three subscales (inattention, hyperactivity, and impulsivity) and a total score. All subscale scores and the FBB-ADHS total score have shown satisfactory internal consistency ($\alpha > 0.80$) and factorial validity [24].

The *Child Behavior Checklist* (*CBCL*) is a parent-rated questionnaire assessing a broad spectrum of child behavioral and emotional problems. It consists of 118 problem behavior questions associated with two superordinate scales that reflect externalizing (e.g., can't sit still, restless, or hyperactive; cruel to animals) and internalizing syndromes (e.g., complains of loneliness; too shy or timid). Furthermore, the items can be aggregated to eight syndrome scales: aggressive behavior, anxious/depressed, attention problems, rule-breaking behavior, somatic complaints, social problems, thought problems, and withdrawn/depressed. Each item is rated on a three-point Likert scale (0 "not true" to 2 "true") referring to the child's behavior in the past six months. Higher scores indicate a higher degree of symptoms. The German version of the CBCL is a highly reliable rating scale ($\alpha = 0.69$–0.93 for the subscales). Further, all subscale scores and the total score have shown factorial validity [28].

The *Parent-Questionnaire for Measuring Health-Related Quality of Life in Children and Adolescents* (*KINDL*) [29, 30] is a German measure for health-related quality of life. It consists of 24 items (e.g., my child felt ill; my child was proud of him-/herself; my child was liked by other kids) that are rated on a five-point Likert scale (0 "never" to 4 "all the time") associated with six dimensions: physical well-being, emotional well-being, self-esteem, family, friends, and everyday functioning. Subscale scores and a total score can be computed by averaging the associated item scores, with higher scores indicating better health-related quality of life. All subscale scores and the total score have shown satisfactory internal consistency ($\alpha > 0.70$) and convergent validity [29, 31].

The *Family Burden Scale* (*FaBel*) [32] is the German version of the Impact on Family Scale [33], which originally measures the parents' perception of the effects of the child's ongoing health condition on family life. It consists of 33 items (e.g., needs to change plans at last minute; see family and friends less; think about not having more children) that are rated on a four-point Likert scale (1 "strongly agree" to 4 "strongly disagree") and are associated with five dimensions: financial impact, social relationships, personal strain, problems in coping, and concern for siblings. Subscale scores and a total score are computed by averaging the associated item scores. Higher scores indicate a lower family burden. Psychometric calculations showed satisfactory internal consistency and validity [32]. For the use in this study, the term 'illness' was replaced by 'behavioral problems' to ensure that parents rated family burden caused by their child's behavioral problems. Furthermore, the questionnaire was shortened by excluding two items which cover consequences of chronic somatic conditions rather than consequences of behavioral problems. In the present study, the scales showed acceptable to high internal consistencies, with Cronbach's alpha ranging from $\alpha = 0.73$ to 0.89.

Data analyses

The study data were analyzed using the Statistical Package for the Social Sciences (SPSS) 23.0, Mplus 7.4 [34], and Microsoft Excel. Initially, CFA was performed with Mplus to examine the factorial structure of the WFIRS-P for ODD/CD. Due to the four-point Likert scale, item scores were considered as ordered categorical data. Therefore, the robust weighted least squares with mean and variance adjustment estimator (WLSMV) was used for model estimation [34, 35]. To handle missing data, the default procedure for WLSMV in Mplus was used (pairwise present analysis) [34]. Five different models were tested and compared (see Fig. 1).

Initially, a one-factor model (unidimensional model), suggesting one general factor of functional impairment that influences all items, was examined to support the scoring and interpretation of the total score (model I). Second, a first-order model with four correlated factors consistent with the a priori expected scale structure of the WFIRS-P for ODD/CD (Family, Learning and School, Life Skills, Social Activities) was tested (model II). Third, referring to previous findings [16, 25], a first-order model with five correlated factors (dividing the Learning and School scale into two subscales) was specified (model III). Models II and III imply that each first-order factor influences a subset of items. Furthermore, a second-order model (model IV) was tested. In contrast to the previous models, in this model functional impairment is a general factor that accounts for the relationship among lower-order factors representing each of the five domains: Family, School Behavior, Learning, Life Skills, Social Activities. Multiple items on the measure in turn represent each of the lower-order factors. Lastly, a bifactor model with five specific factors was evaluated (Model V). A bifactor model tests whether there is a general factor that accounts for the variance in item scores and whether there are specific factors to further explain variance in item subsets that cannot be attributed to the general factor [36]. Transferred to the WFIRS-P for ODD/CD it means, that there is a single functional impairment factor that underlies each of the items. Additionally, there are domain-specific factors of impairment (family, school behavior, learning, life skills, social activities), each of which accounts for unique variance in their own separate set of domain-related items. Since the WFIRS-P for ODD/CD provides a total score of general impairment and subscale scores of impairment in specific domains, we assumed that a bifactor model would best fit the data.

Model fits were evaluated using several fit indices. First, the χ^2 (Chi square) fit statistic and the χ^2/df ratio were considered. If the p value associated with the χ^2 value is greater than 0.05, the test indicates that the model fits the data. Due to the dependence of the χ^2 value on sample size, Schermelleh-Engel et al. [37] recommend using the ratio χ^2/df, which should be as small as possible for a good model fit. A ratio of 3 represents an 'acceptable' and a ratio of 2 a 'good' data-model fit [37]. Beyond that, the comparative fit index (CFI), with a suggested cut-off for acceptable fit of CFI > 0.90 [35], and the root mean square error of approximation (RMSEA), with a suggested cut-off for acceptable fit of RMSEA < 0.08 [35], are reported. For the purpose of comparison of nested models (II vs. III; IV vs. III; IV vs. V), the χ^2 difference test in Mplus based on the WLSMV estimator was used [34]. The first-order correlated-factors model with four factors and the second-order model are nested within the less restricted first-order correlated model with five factors and the bifactor model [38, 39]. If the χ^2 difference test is significant, the less restricted model should be retained, and if it is non-significant, the more restricted model should be favored [37]. Regarding the sample size, Chen et al. demonstrated that

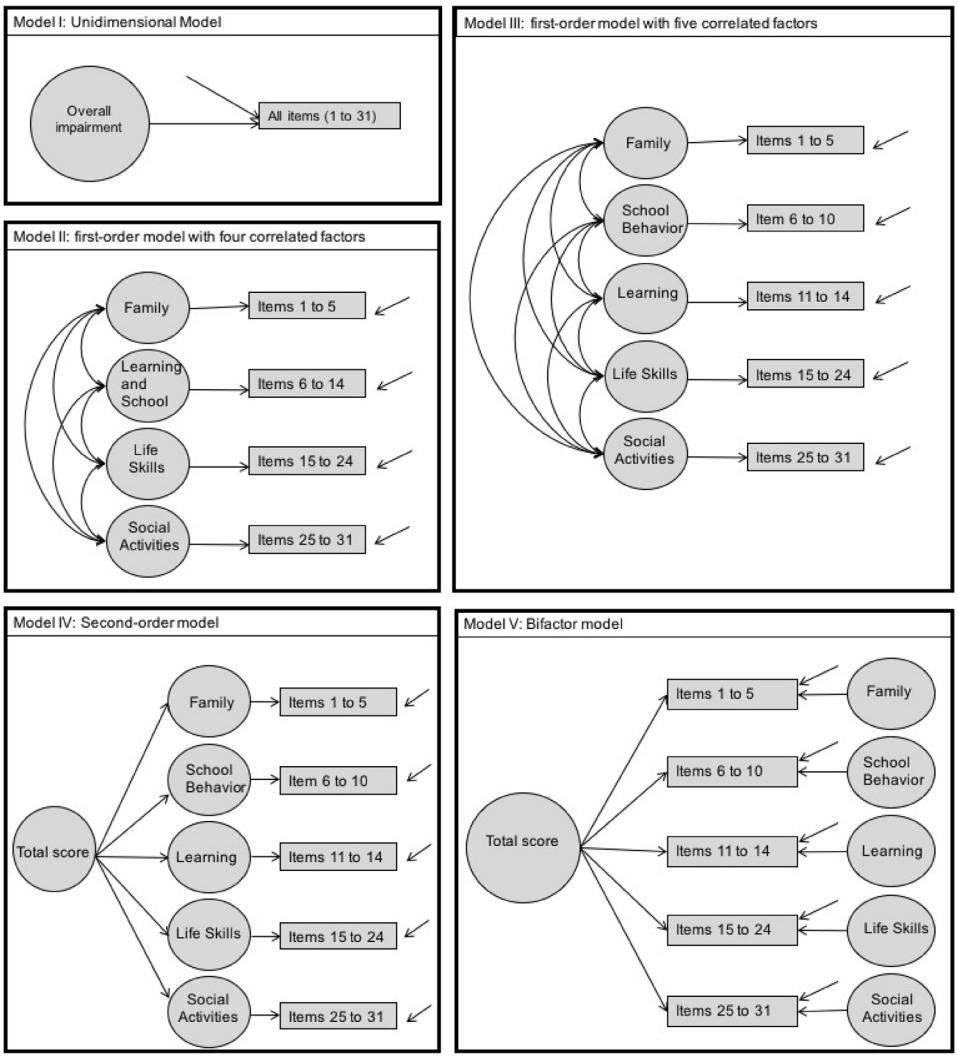

Fig. 1 Possible alternative factor structures underlying the Weiss Functional Impairment Rating Scale—Parent Report for ODD/CD which were examined by the use of confirmatory factor analysis

even a small sample size of 200 is sufficient to differentiate between a bifactor model and a second-order model [40].

The reliability of the WFIRS-P for ODD/CD domain scores was tested using Cronbach's alpha. As alpha is not recommended for estimating the reliability of higher-order constructs (second-order/bifactor models), omega (ω) statistics were additionally calculated [38].

To assess the validity of the WFIRS-P for ODD/CD, Pearson's correlation coefficients (r) between the WFIRS-P for ODD/CD subscale scores and the subscales of other scales such as the FBB-SSV, the FBB-ADHS, the CBCL, the KINDL, and the FaBel were considered.

Finally, a multiple regression analysis was conducted, including the WFIRS-P for ODD/CD total score on the one hand and the FBB-SSV, FBB-ADHS, and the CBCL on the other. To analyze which predictor (symptom area) best predicts the outcome (functional impairment), a forward stepwise regression was calculated. Here, we expected that symptoms of ODD/CD and ADHD would explain the largest proportion of variance. Additionally, we assumed that the combination of ODD/CD, ADHD, and other symptoms would explain more variance than ODD/CD symptoms only.

Results

Confirmatory factor analyses

According to the specified fit indices, the first-order correlated-factors model with five factors (model III), the second-order model with five first-order factors, and the bifactor model all provided a satisfactory fit to the data (see Table 1).

The fit statistics of the first-order correlated-factors model with five factors (model III) indicated an acceptable model fit. Standardized parameter estimators suggested that all items were appropriate indicators of their specific factor ($\lambda > 0.30$). The five dimensions were correlated with estimated correlations between 0.18 and 0.57, suggesting that

Table 1 Confirmatory factor analyses comparing alternative models of the WFIRS-P for ODD/CD (Estimator: WLSMV)

Model	χ^2	df	χ^2/df	*p*	CFI	RMSEA	$\Delta\chi^2$	df
I. Unidimensional model	1721.09	434	3.97	< .01	0.68	0.12	–	–
II. First-order correlated-factors model (four factors)	894.89	428	2.09	< .01	0.89	0.07	–	–
III. First-order correlated-factors model (five factors)	736.157	424	1.74	< .01	0.92	0.06	–	–
IV. Second-order model with five first-order factors	824.319	429	1.92	< .01	0.90	0.07	–	–
V. Bifactor model (five specific factors)	693.432	403	1.72	< .01	0.93	0.06	–	–
II vs. III	–	–	–	–	–	–	73.519*	4
IV vs. III	–	–	–	–	–	–	46.213*	5
IV vs. V	–	–	–	–	–	–	127.221*	26

Sample size: $n = 219$; WLSMV = robust weighted least squares with mean and variance adjustment estimator, χ^2 empirical χ^2 value, *df* degrees of freedom, *p* empirical significance value, *CFI* comparative fit index, *RMSEA* root mean square error of approximation, *CI* confidence interval, $\Delta\chi^2$ = corrected difference between χ^2 values of two competing models for difference testing

*$\Delta\chi^2$ test significant at the level of 1%

the factors share a certain amount of common variance. Through comparison with the χ^2 difference test, this model with five correlated factors showed a significantly better model fit than the first-order correlated-factors model with four factors (model II; $\Delta\chi^2 = 73.52$; df = 4; $p < .01$).

The second-order model with five factors (model IV) showed similar, but slightly worse fit indices to model III (see Table 1). The standardized loadings of the first-order factors on the second-order factor were all significant and above the threshold of $\lambda = 0.30$. The result of the χ^2 difference test indicates that the first-order correlated-factors model with five factors (model III) should be preferred over the second-order model ($\Delta\chi^2 = 46.21$; df = 5; $p < .01$).

On a descriptive level, the bifactor model with all items loading on a general factor and five group factors provided slightly better fit indices than the alternative models. The results of the χ^2 difference test indicated that the bifactor model fitted the data significantly better than the second-order model (model V, $\Delta\chi^2 = 127.221$; df = 26; $p < .01$). With the exception of items 1, 9, and 15, all items loaded significantly on the general factor (see Table 2). Beside the factor loadings of items 1, 9, 14, and 15, all loadings exceeded the minimum threshold of $\lambda = 0.30$. This indicated that the general construct has low impact on the items 1, 9, 14, and 15. Most items showed substantial loadings on their specific group factor. Exceptions occurred for items 10, 22, 25, and 26. Several items of the Social Activities scale (25, 26, 27, 28) showed considerably higher standardized loadings on the general factor than they did on the specific factor. This was not (or to a much lesser extent) the case for the items of the other subscales.

Reliability

The total scale and all subscales of the WFIRS-P for ODD/CD demonstrated good internal consistency (see Table 3). Cronbach's alpha exceeded 0.70 for all scales; item-subscale correlations were mostly moderate to high (r_{it} = .30–.77). Omega was 0.92 for the total scale and ranged from 0.75 to 0.85 for the subscales. The omega hierarchical (ω_S), which displays the amount of variance in item subsets explained by the specific factors, ranged from 0.37 to 0.60. It should be noted that for the Social Activities scale, the specific factor accounted for less variance ($\omega_S = 0.37$) than the general factor ($\omega_S = 0.48$). For the other subscales, the respective specific factor accounted for more variance than the general factor of functional impairment.

Validity

The correlations between the WFIRS-P for ODD/CD and the FBB-SSV, the FBB-ADHS, the CBCL, the KINDL, and the FaBel are shown in Table 4.

Predominantly low to moderate correlations were found between the WFIRS-P for ODD/CD and symptoms of ODD/CD and ADHD, respectively. On the subscale level, the highest correlations were found between symptoms of ODD/CD (FBB-SSV) and the family, life skills, and social activities subscales ($r = .28$–$.46$), while ratings of ADHD symptoms, especially symptoms of inattention, correlated particularly with the learning and the life skills subscale.

Low to moderate correlations also emerged between the WFIRS-P for ODD/CD and the CBCL. Associations with externalizing behavior problems were higher than associations with internalizing behavior problems. The highest associations emerged between the aggressive behavior subscale of the CBCL and the family subscale of the WFIRS-P for ODD/CD ($r = .45$), and between the attention problems subscale of the CBCL and the life skills subscale of the WFIRS-P for ODD/CD ($r = .41$).

A statistically significant correlation in the moderate range was found between the WFIRS-P for ODD/CD total

Table 2 Standardized factor loadings and standard errors (in brackets) of the bifactor model of the WFIRS-P for ODD/CD in the total sample

Item	Description	Total scale	Family	School behavior	Learning	Life skills	Social activities
1	Having problems with brothers and sisters	0.13 (0.07)[ns]	0.57 (0.06)				
2	Causing problems between parents	0.36 (0.07)	0.59 (0.06)				
3	Makes it hard for the family to have fun together	0.47 (0.06)	0.74 (0.05)				
4	Provokes others to hit or scream at him/her	0.30 (0.07)	0.56 (0.06)				
5	Makes parenting difficult	0.70 (0.05)	0.55 (0.06)				
6	Causes problems for the teacher in the classroom	0.43 (0.07)		0.76 (0.06)			
7	Having problems in the school yard	0.67 (0.05)		0.42 (0.07)			
8	Receives "time-out" or removal from classroom	0.39 (0.07)		0.78 (0.06)			
9	Suspended or expelled from school	0.15 (0.09)[ns]		0.58 (0.08)			
10	Misses classes or is late for school	0.36 (0.08)		0.30 (0.10)			
11	Receives grades that are not as good as his/her ability	0.40 (0.07)			0.48 (0.07)		
12	Makes it difficult to keep up with schoolwork	0.54 (0.06)			0.50 (0.07)		
13	Needs extra help at school	0.53 (0.06)			0.69 (0.06)		
14	Needs tutoring	0.26 (0.09)			0.92 (0.07)		
15	Excessive use of TV, computer, or video games	0.13 (0.08)[ns]				0.41 (0.08)	
16	Keeping clean, brushing teeth, brushing hair, bathing, etc.	0.30 (0.09)				0.69 (0.06)	
17	Problems getting ready for school	0.55 (0.06)				0.59 (0.06)	
18	Problems getting ready for bed	0.46 (0.07)				0.67 (0.05)	
19	Problems with eating	0.33 (0.08)				0.57 (0.06)	
20	Problems with sleeping	0.33 (0.08)				0.45 (0.07)	
21	Gets hurt or injured	0.37 (0.09)				0.39 (0.09)	
22	Avoids exercise	0.59 (0.06)				0.24 (0.07)	
23	Needs more medical care	0.45 (0.09)				0.61 (0.09)	
24	Has trouble taking medication, getting needles, or visiting the doctor	0.39 (0.12)				0.69 (0.08)	
25	Being teased or bullied by other children	0.56 (0.06)					0.30 (0.08)
26	Teases or bullies other children	0.53 (0.06)					0.29 (0.08)
27	Problems getting along with other children	0.73 (0.05)					0.49 (0.07)
28	Problems participating in after-school activities (sports, music, clubs)	0.49 (0.07)					0.25 (0.09)
29	Problems making new friends	0.50 (0.07)					0.81 (0.06)
30	Problems keeping friends	0.59 (0.06)					0.67 (0.06)
31	Difficulty with parties (not invited, avoids them, misbehaves)	0.48 (0.07)					0.57 (0.06)

WFIRS-P for ODD/CD = German adaption of the Weiss Functional Impairment Rating Scale—Parent Report for ODD/CD, sample size $n = 219$, *ns* non-significant loading

score and the KINDL total score. On the subscale level, the WFIRS-P for ODD/CD subscales correlated particularly with KINDL subscales that cover similar concepts (e.g., WFIRS-P for ODD/CD family subscale with KINDL family subscale; WFIRS-P learning subscale with KINDL school subscale; WFIRS-P for ODD/CD social activities subscale with KINDL friends subscale).

Statistically significant correlations in the moderate range emerged between the FaBel total scale and the WFIRS-P for ODD/CD total score.

A multiple regression was calculated to predict functional impairment based on ODD/CD, ADHD, and other symptoms. The total score of the FBB-SSV was the best single predictor, explaining 23% of the variance, followed by the FBB-ADHS total score, and the CBCL Social Problems subscale. The multiple regression model with all three predictors produced $R^2 = .44$, which means that the FBB-SSV, the FBB-ADHS, and the CBCL Social Problems subscale account for 44% of the variation in the WFIRS-P for ODD/CD total score. The other variables of the model (remaining

Table 3 Descriptive statistics, internal consistencies, part-whole corrected item-scale correlations, range of factor loadings, and omega statistics of the WFIRS-P for ODD/CD (subscales and total scales)

Variable	Number of items	*M*	SD	α	r_{it}	Range of factor loadings	ω	ω_H	ω_S
Total score	31	1.02[a]	0.42[a]	0.88[a]	.20–.62	0.13–0.73	0.92	0.68	–
Family	5	1.32[b]	0.68[b]	0.80[b]	.44–.73	0.55–0.74	0.85	0.25	0.60
School behavior	5	1.27[c]	0.60[c]	0.73[c]	.30–.67	0.30–0.78	0.82	0.27	0.55
Learning	4	0.88[d]	0.76[d]	0.77[d]	.51–.65	0.48–0.92	0.75	0.23	0.52
Life skills	10	0.57	0.47	0.79	.32–.63	0.24–0.69	0.84	0.29	0.55
Social activities	7	1.37[e]	0.72[e]	0.86[e]	.50–.77	0.25–0.81	0.85	0.48	0.37

Overall sample size $n = 219$, [a]$n = 202$, [b]$n = 214$, [c]$n = 213$, [d]$n = 211$, [e]$n = 216$

M mean (items rated on a four-point Likert scale ranging from 0 to 3), *SD* standard deviation, α Cronbach's alpha (internal consistency), r_{it} range of part-whole corrected item-scale correlations, ω omega (amount of variance accounted for by the total scale and the subscales taken together), ω_H omega hierarchical (amount of variance accounted for by the total scale), ω_S omega hierarchical subscale (amount of variance accounted for by the subscale). The different sample sizes are due to missing values

subscales of the CBCL) did not significantly contribute to the explanation of variance in the WFIRS-P for ODD/CD total score.

Discussion

This article is the first to assess the psychometric properties of the WFIRS-P in children with aggressive behavior problems. The WFIRS-P was originally designed to measure functional impairment in children and adolescents with ADHD. Due to the lack of measures assessing functional impairment in children with aggressive behavior problems, the purpose of this study was to extend the applicability of the WFIRS-P to ODD/CD. To meet this objective, the WFIRS-P was adapted (WFIRS-P for ODD/CD) to assess impairment in ODD/CD, and its psychometric properties were assessed in a sample of children with aggressive behavior problems. Overall, the findings regarding the psychometric properties are in line with previous studies on the WFIRS-P [16, 17, 25–27] and support the applicability for ODD/CD.

With regard to the conceptual framework of the questionnaire, the result of our CFA indicated a poor model fit of the unidimensional model (model I). These findings for model I call into question the interpretation of a single total score [25]. This is similar to findings of studies by Gajria et al. [25] and Dose et al. [17]. The model fit of the first-order correlated-factors model with four factors (model II) was close to, but did not reach, the minimum threshold (CFI > 0.90) for acceptable model fit. Comparable with the results of some previous studies [16, 25], the fit indices improved significantly when the items of the school learning–behavior scale were modeled as two different scales—school behavior and learning. This first-order correlated-factors model with five factors (model III) provided a satisfactory model fit. Furthermore, standardized parameter estimators suggested that all items were strong indicators of their specific factor ($\lambda > 0.30$). Besides model III, higher-order models (models IV and V) also fitted the data well. Descriptively, the second-order model with five factors (model V) showed similar, but slightly worse fit indices compared to model III. This was confirmed by the χ^2 difference test indicating the preference for model III. The bifactor solution showed a slightly superior fit to models III and IV, which is in line with the findings by Dose et al. [17] so that we could confirm the conceptual framework of a general construct of impairment (total scale) and additional specific impairments (subscales). Here, omega statistics revealed that for four subscales (family, school behavior, learning, life skills), the specific factor accounted for more variance than the general factor of functional impairment, indicating that these scales are more likely to reflect specific domains of impairment than a common general construct of functional impairment. This conclusion is supported by the factor loadings, which were stronger on the subscales than on the general scale. Only for the social activities subscale the general scale accounted for more variance than the specific factors and the items showed stronger loadings on the general factor. This may be due to the fact that the social activities subscale itself describes a more general area of impairment, which is also covered by the remaining subscales. For instance, the item 'Having problems in the school yard' from the school behavior subscale can also be applied to the social activities subscale. In contrast to these results, Dose et al. [17] revealed that in children with ADHD, the general factor of functional impairment accounted for more variance than the specific factors. Here, only for the learning and school subscale the specific factor accounted for more variance. One possible explanation is that ADHD is a more general disorder that affects several areas of impairment, while ODD/CD is a more domain concentrated disorder that affects only

Table 4 Correlations between the WFIRS-P for ODD/CD and the FBB-SSV, FBB-ADHS, CBCL, KINDL, and FaBel

	WFIRS-P for ODD/CD						
	n	Total score	Family	School behavior	Learning^{log}	Life skills^{log}	Social activities
FBB-SSV							
Total score	212–218	0.50**	0.42**	0.24**	0.20**	0.33**	0.42**
Oppositional behavior		0.51**	0.39**	0.28**	0.18**	0.33**	0.46**
Antisocial behavior^{log}		0.41**	0.40**	0.13	0.19**	0.28**	0.31**
FBB-ADHS	203–219						
Total score		0.49**	0.26**	0.20**	0.40**	0.49**	0.25**
Inattention		0.49**	0.17*	0.23**	0.50**	0.51**	0.20**
Hyperactivity		0.37**	0.22**	−0.14*	0.26**	0.38**	0.19**
Impulsivity		0.35**	0.32**	0.10	0.15*	0.28**	0.26**
CBCL	191–196						
Total score		0.51**	0.33**	0.16*	0.21**	0.45**	0.42**
Externalizing		0.45**	0.45**	0.10*	0.17*	0.38**	0.30**
Internalizing		0.36**	0.16*	0.14	0.13	0.26**	0.40**
Aggressive behavior		0.44**	0.45**	0.10	0.13	0.36**	0.33**
Anxious/depressed		0.33**	0.17*	0.10	0.12	0.23**	0.39**
Attention problems		0.43**	0.16*	0.20**	0.34**	0.41**	0.27**
Rule-breaking behavior		0.38**	0.33**	0.10	0.24**	0.36**	0.16*
Somatic complaints		0.24**	0.03	0.11	0.12	0.24**	0.23**
Social problems		0.45**	0.20**	0.22**	0.19**	0.27**	0.50**
Thought problems		0.16*	0.06	−0.07	−0.04	0.30**	0.10
Withdrawn/depressed		0.29**	0.15*	0.16*	0.10	0.18*	0.31**
KINDL	196–206						
Total score		−0.40**	−0.22**	−0.15*	−0.24**	−0.26**	−0.37**
Physical well-being		−0.08	0.07	−0.08	−0.03	−0.03	−0.14*
Emotional well-being		−0.24**	−0.13	−0.08	−0.12	−0.13	−0.28**
Self-esteem		−0.26**	−0.10	−0.13	−0.14	−0.15*	−0.27**
Family		−0.35**	−0.46**	−0.05	−0.17*	−0.24**	−0.18**
Friends		−0.39**	−0.22**	−0.10	−0.13	−0.24**	−0.46**
School		−0.25**	−0.01	−0.18*	−0.41**	−0.24**	−0.06
FaBel	164–219						
Total score		−0.50**	−0.39**	−0.16*	−0.23**	−0.46**	−0.32**
Financial impact		−0.23**	−0.16*	−0.06	−0.15*	−0.24**	−0.11
Social relationships		−0.43**	−0.32**	−0.17*	−0.13	−0.41**	−0.28**
Personal strain		−0.45**	−0.30**	−0.19*	−0.23**	−0.42**	−0.29**
Problems in coping		−0.37**	−0.36**	−0.07	−0.16*	−0.31**	−0.25**
Concern for siblings		−0.38**	−0.40**	−0.04	−0.25**	−0.27**	−0.26**

WFIRS-P for ODD/CD German adaption of the Weiss Functional Impairment Rating Scale—Parent Report for ODD/CD, *FBB-SSV* symptom checklist for oppositional defiant and conduct disorder, *FBB-ADHS* symptom checklists for attention-deficit/hyperactivity disorder, *CBCL* child behavior checklist, *KINDL* the parent-questionnaire for measuring health-related quality of life in children and adolescents, *FaBel* The Family Burden Scale, *n* sample size

*Correlation coefficients were significant at the level of 5% (not adjusted)

**Correlation coefficients were significant at the level of 1% (not adjusted), *log* log-transformation. The different sample sizes are due to missing values

specific areas of impairment. For example, a child could behave aggressive towards peers at school, whereas it does not show aggressive behavior towards its parents at home.

Domain scores satisfied accepted minimum standards of reliability. Consistent with studies in children with ADHD [16, 17, 25–27], the WFIRS-P for ODD/CD demonstrated satisfactory internal consistency. Omega statistics showed that both the general construct and specific factors accounted for item variance.

Furthermore, the WFIRS-P for ODD/CD subscales mainly correlated in a hypothesis-confirming range with other scales (KINDL, FaBel, FBB-SSV, FBB-ADHS, CBCL) and thus showed good validity. Regarding questionnaires that measure similar concepts, such as the KINDL and the FaBel, mostly moderate correlations were found, suggesting that these instruments have something in common, but are not the same. At the subscale level, the strongest correlations were found between scales that cover similar concepts. Furthermore, low correlations were found between the physical well-being scale of the KINDL and the WFIRS-P for ODD/CD. This result is similar to findings from studies reporting a low impairment in physical well-being, but a large impairment in psychosocial health in children with ADHD and ODD/CD [4–7]. Comparable results were reported by Tarakçıoğlu et al. [27], who examined the relationship between the WFIRS-P and the Pediatric Quality of Life Inventory (PedsQL) [41], which measures psychosocial and physical health. Although an accurate comparison cannot be made since the quality of life scale used in the aforementioned study differs from that employed in our study, correlations support the divergent validity between the general quality of life scales and the WFIRS-P in both studies.

The moderate multiple correlation coefficient between symptoms of ODD/CD and ADHD and functional impairment, respectively, indicated that these concepts are related, but also distinct. As expected, in multiple regression analyses, symptoms of ODD/CD and ADHD explained the largest proportion of variance in functional impairment.

Of course, the study has several limitations. First, the study had stringent inclusion and exclusion criteria. Second, the results are mostly restricted to boys—the group with the highest prevalence rate of ODD/CD [22]. This population may not be representative of all children with ODD/CD seen in general practice settings. Further research should also focus on girls. Additionally, data were gathered exclusively by parent rating. A further rater perspective (e.g., teacher) would have been useful, especially to assess functional impairment at school. Another potential limitation of this study concerns the limited number of criteria measures. Here, in particular, the convergent validity of the WFIRS-P for ODD/CD with other measures of functional impairment remains to be assessed. Lastly, a replication of the current result in larger samples is needed.

Despite certain limitations, the study results suggest that the modified WFIRS-P is adequate for the assessment of functional impairment in children with ODD/CD. We conclude that a bifactor model with a general factor and five independent specific group factors fits the data better than correlated factor models in a clinical sample of children with aggressive behavior between 6 and 12 years of age. Reliability estimators are satisfactory and support the interpretability of both subscales and a general scale. Moreover, the WFIRS-P showed adequate divergent validity from measures of ODD/CD, ADHD, and other symptoms.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interests.

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

Informed consent Informed consent was obtained from all individual participants included in the study. Written informed consent was obtained from the parents.

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