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Original article

German validation of the Conners Adult ADHD Rating Scales–self-report (CAARS-S) I: Factor structure and normative data

H. Christiansen^{a,1,*}, B. Kis^{b,1}, O. Hirsch^c, A. Philipsen^d, M. Henneck^e, A. Panczuk^e,
 R. Pietrowsky^e, J. Hebebrand^f, B.G. Schimmelmann^g

^a Philipps-University Marburg, Department of Clinical Psychology, Gutenbergstr. 18, 35037 Marburg, Germany

^b University of Duisburg-Essen, Department of Psychiatry and Psychotherapy, Essen, Germany

^c Philipps-University Marburg, Department of General Practice/Family Medicine, Marburg, Germany

^d University of Freiburg, Department of Psychiatry and Psychotherapy, Freiburg, Germany

^e University of Düsseldorf, Institute of Experimental Psychology, Department of Clinical Psychology, Düsseldorf, Germany

^f University of Duisburg-Essen, Department of Child and Adolescent Psychiatry and Psychotherapy, Essen, Germany

^g University Hospital of Child and Adolescent Psychiatry, Bern, Switzerland

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ABSTRACT

Background. – Attention-deficit/hyperactivity disorder (ADHD) often persists into adulthood. Instruments for diagnosing ADHD in childhood are well validated and reliable, but diagnosis of ADHD in adults remains problematic. Attempts have been made to develop criteria specific for adult ADHD, resulting in the development of self-report and observer-rated questionnaires. To date, the Conners Adult ADHD Rating Scales (CAARS) are the international standard for questionnaire assessment of ADHD. The current study evaluates a German version of the CAARS self-report (CAARS-S).

Methods. – Eight hundred and fifty healthy German control subjects were recruited to fill out the CAARS-S and to answer questions on sociodemographic variables. Explorative and confirmative factor analyses were conducted to obtain the factor structure for the German model and to replicate the factor structure of the original American model. Analyses on gender, age, and education level were calculated for normative data.

Results. – The explorative factor analysis of the German sample results in a six-factor solution that explained 52% of the variance. A confirmative analysis that was based on the 42 items of the original American model showed a high model-fit. Analyses of normative data showed significant influences of age, gender, and education level on the emerging subscales.

Conclusion. – Even though the explorative factor analysis yields a solution different from the American original, the confirmative factor analysis results in such a high model-fit that use of the American version is justified with respect to international multicenter studies, for which this instrument will be highly valuable.

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1. Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is listed under disorders usually first diagnosed in infancy, childhood, or

adolescence (DSM-IV/ICD-10). Nevertheless, it is well agreed that ADHD often persists into adulthood [26,23,33], with prevalence rates falling between 4 to 5% [13]. Instruments for diagnosing ADHD in childhood are well validated and reliable, but diagnosis of ADHD in adults remains problematic [6]. Discussions about the appropriateness of DSM-IV criteria for adult ADHD are controversial, since they were designed for and based on studies with children [13]. Recent publications indicate that diagnosing ADHD in adulthood using DSM-IV is hampered if the number of symptoms does not achieve the threshold for diagnosis or if onset prior to the DSM-IV age at onset criterion cannot be established [16]. Attempts have been made to develop criteria specific for adult ADHD [8,11,34], resulting in the development of self-report and observer-rated questionnaires. For English speaking countries, there are some well validated diagnostic instruments for assessing

Abbreviations: ADHD, Attention-deficit/hyperactivity disorder; ADHD-DC, German ADHD observer-rating scale; ADHD-SR, German ADHD self-rating scale; ASRS, Adult Self-Report Scale; CAARS, Conners Adult ADHD Rating Scales; CAARS-S, Conners Adult ADHD Rating Scale self-report; CAARS-O, Conners Adult ADHD Rating Scale observer-rating; CP/TRS, Conners Parent/Teacher Rating Scale; DSM-IV, Diagnostic and Statistical Manual of the American Psychiatric Association, 4th version; ICD-10, International Classification of Diseases, 10th version; WHO, World Health Organization; WURS/WURS-K, Wender Utah Rating Scale/German short version.

* Corresponding author. Tel.: +0049 0 6421 282 3706; fax: +0049 0 6421 282 4281.

E-mail address: christih@staff.uni-marburg.de (H. Christiansen).

¹ The first two authors contributed equally to this paper.

adult ADHD symptoms [13,35,4], such as the Conners Adult ADHD Rating Scales [11], the Adult ADHD Self-Report Scale [2,3,29], the Brown Attention-Deficit Disorder Rating Scale for Adults [8], the Wender Utah Rating Scale (WURS) [34], the Current Symptoms Scale [5], and the ADHD Rating Scale IV [14]. However, easy-to-handle measures are still rare for German-speaking countries. Retz-Junginger et al. (2002) [27,28] validated a German short version of the Wender Utah Rating Scale, the WURS-k. This is a 25-item standardized instrument with four control items, rated on the extent of severity from 0 (not at all) to 4 (severely), to retrospectively establish a childhood diagnosis of ADHD in adults. Since DSM-IV requires an onset of ADHD symptoms before the age of seven, such self-reports face the diverse problems innate to retrospective recall and hindsight bias [36,25]. Other available German instruments are the self-rating behavior questionnaire for ADHD (ADHD-SR) and an observer-rating diagnostic checklist (ADHD-DC [29]). The Adult Self-Report Scale (ASRS) and the ASRS Screener are official instruments of the WHO and also available in different languages including German [2,3,22,29]. The ASRS contains the 18 DSM-IV items. The screener has four inattention items and two hyperactivity items, that highly correlate with the full scale ASRS. The items can be scaled from 0 to 4. Basic psychometric properties like internal consistency and convergent validity have been determined. All scales are based on DSM-IV and ICD-10 research criteria and assess current ADHD symptoms, thus facing the problems of appropriate assignability of these criteria to adults. The ADHD-SR and ADHD-DC are only used in German-speaking countries rendering international comparability difficult. Thus a well-validated and internationally used instrument to validly assess ADHD symptoms in adults with respect to international and/or multicenter studies is missing for German-speaking countries.

To date, the Conners Adult ADHD Rating Scales (CAARS) are frequently used in the assessment of adult ADHD [13,32]. The CAARS are available in a self- and observer-rating form (CAARS-S/CAARS-O). The long rating form consists of 66 items to be rated on a Likert scale from 0 (not at all) to 3 (severely); the short form only has 26 items to be rated in the same format. Both scales were psychometrically well validated in two American studies [12,15]. In the first one, normative data of 839 subjects and a clinical sample of 167 ADHD patients were examined. Participants in the normative sample were 394 males and 444 females (age 18 to 81; mean 39.19 years [SD = 12.64] for the males, and 39.55 [SD = 12.49] for females). Explorative principal component analyses in that sample yielded a four-factor questionnaire structure solution, i.e. inattention/cognitive problems, hyperactivity/restlessness, impulsivity/emotional lability, and problems with self-concept for both the normative and clinical sample. This structure covers the core features of ADHD as seen in children and adolescents and adds features of adult ADHD (cognitive problems, emotional lability, problems with self-concept).

The second validation study tested the internal consistency, test-retest reliability, concurrent validity, criterion validity, and the diagnostic utility of the CAARS in a clinical sample of 167 adults (97 males and 70 females). All subjects were referred to an outpatient ADHD clinic for diagnostic assessment. The mean age was 34.3 years (SD = 11.6). All psychometric quality criteria reached highly satisfactory values [15].

The present study aims to validate the German version of the CAARS-S (translation Christiansen et al., 2007) through replication of the derived factor structure of the American original. Since cross-cultural generalizability of the scales is not self-evident [20], an explorative factor analysis will be conducted first, to obtain factor structure for the German version in a German sample (German model). In a second step, the original 42 items of the CAARS-S will be analysed in the German sample with a

confirmative factor analysis (American model) to determine concordance, goodness of fit (GFI), and differences in factor structure in comparison to the American original.

2. Subjects and method

2.1. Procedure and subjects

This is a cross-sectional study on healthy German adults. Participants were recruited by convenience sampling (university students, people from apprentice institutions, local neighborhoods, waiting areas such as airports, hairdressers, general practitioners, and colleagues). Subject were provided with a short study description, and asked to fill out the Conners' self-rating questionnaire (CAARS-S) as well as the WURS-k and questions on age, gender, and education level. Additionally they were asked to have the Conners' observer-rating questionnaire (CAARS-O: L) filled out by a significant other. The CAARS-O: L and WURS-k scales were given out to obtain data for convergent validity in a healthy sample that is to be compared with patient data in a second manuscript. A study protocol in accordance with the criteria of the Declaration of Helsinki was reviewed and approved by the local institutional review board. Written informed consent was obtained from all participants, and their confidentiality was assured. All subjects completed the questionnaires at home and sent them back to the Department of Child and Adolescent Psychiatry and Psychotherapy of the University of Duisburg-Essen.

The total sample consisted of 850 adults. Of those, 847 reported gender (330 males and 517 females), age and SES. Complete questionnaires were returned by 788 study participants, with the remaining 62 showing missing data on item level. The mean age of the females was 34.12 years (SD = 13.57) with a range from 18 to 80 years of age. Mean age of the males was 37.95 years (SD = 14.34) with a range from 18 to 77 years of age. The majority of all participants had a higher level of education (62.85%; females: 58.30%, males: 67.40%).

2.2. Methods: description of the Conners' Adult ADHD Rating Scale (CAARS® MHS, North Tonawanda, NY)

The CAARS assesses ADHD symptoms in adults ages 18 and up. Both forms (self-report and observer form) rate symptoms on a Likert scale, i.e. severity from 0 (not at all/never) to 3 (very much/very frequently). The long form consists of 66 items, but only 42 items were included in the original factor analysis. This is due to restrictions made by the authors [12] namely: Scree-test and eigenvalues greater than one, exclusion of factor loadings less than 0.30, factors loading greater than 0.30 not on more than one factor. A varimax rotation yielded the four factors: inattention/memory problems, hyperactivity/restlessness, impulsivity/emotional lability, and Problems with Self-Concept [12]. Additionally, an ADHD index and indices for DSM-IV subscales (DSM-IV: predominantly inattentive, predominantly hyperactive-impulsive, combined subtype) can be obtained [10]. Test-retest correlations range between 0.80 (impulsivity/emotional lability) and 0.91 (problems with self-concept). Construct-validity with the Wender Utah Rating Scale (WURS) reached moderate to satisfying correlations of 0.37 (inattention problems) to 0.67 (impulsivity/emotional lability). Criterion validity with a semistructured interview for adult ADHD yielded a sensitivity of 82% and a specificity of 87% [15].

2.3. Statistical analyses

All raw data were stored at a database in Essen, Germany (University of Duisburg-Essen, Department of Child and Adolescent

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