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Conceptual Structure of the Symptoms of Adult ADHD According to the *DSM-IV* and Retrospective Wender-Utah Criteria

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Abstract

Objective: Adult *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*) and retrospective childhood Wender-Utah ADHD criteria are implemented in self-report measures to assess adult ADHD and its required onset in childhood. Yet their dimensional structure and relationship to adult ADHD depressivity is still at debate. Therefore, both aspects were investigated, applying two respective German instruments (ADHD–Self-Report [ADHD-SR] and Wender Utah Rating Scale–German [WURS-G]) to two student samples. **Method:** ADHD-SR and WURS-G dimensions were identified by nonlinear confirmatory factor analyses, and their interrelations and relationship with adult depressivity were identified by structural equation modeling. **Results:** Adult ADHD-SR symptoms were organized into inattention, hyperactivity, and impulsivity, and WURS-G symptoms were organized into inattention/hyperactivity, affect lability, depressivity, and conduct problems. Yet only the first two WURS factors directly affected adult ADHD facets, though childhood depressivity influenced them indirectly via adult depressivity. **Conclusion:** Only criteria of the first two WURS factors can be considered valid childhood ADHD indicators. Thus, only they should be used as an aid in the retrospective assessment of ADHD symptoms. *(J. of Att. Dis. 2013; 17(2) 114-127)*

Keywords

adult ADHD, childhood ADHD, short WURS, ADHD-SR, confirmatory factor analyses, structural equation modeling

Introduction

ADHD, which is characterized by symptoms of inattention, hyperactivity, and impulsivity, was originally diagnosed only in children. Yet during the last two decades, it has been gradually acknowledged that ADHD symptoms may persist into adulthood, though the severity and quality of ADHD symptoms usually change during the developmental process: Inattention symptoms usually last more frequently into adulthood than symptoms of hyperactivity and impulsivity. Also, fewer symptoms of ADHD may still be present in adults than were seen in their childhood (e.g., First, Frances, & Pincus, 2002; Wilens, Biederman, & Spencer, 2002).

Recent studies have suggested that the original *Diagnostic and Statistical Manual of Mental Disorders* (*DSM*) age-at-onset criterion of 7 years is too restrictive and that patients may have limited recall of the exact time of onset of symptoms (McGough & Barkley, 2004). Yet an onset at least before the age of 12 years is still considered a prerequisite for a valid adult ADHD diagnosis (Kieling et al., 2010). Following this criterion, the presence of ADHD symptoms in childhood must be ascertained retrospectively for adults. Therefore, self-report instruments are needed, which reliably and validly capture present and preceding childhood ADHD symptoms in adults. Such instruments are also in demand for epidemiological surveys and for screening purposes in nonclinical populations: Most previous studies focused on self- or other-referred patients with the consequence that there are still only few studies addressing specific characteristics of adult ADHD as well as its prevalence in the general population. However, two large epidemiological studies report a prevalence of adult ADHD of 3.4% and 4.4% (Fayyad et al., 2007; Kessler et al., 2006).

Most of the currently used adult ADHD self-report instruments operationalize either the ADHD conception of

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the *DSM* (for a summary see, for example, Rösler et al., 2006) or that of the Wender-Utah approach (Ward, Wender, & Reimherr, 1993; Wender, 1971). Shortcomings of both approaches have been outlined comprehensively (e.g., McGough & Barkley, 2004). Therefore, only the most important ones are summarized here: Both approaches devised ADHD diagnostic criteria originally for children. Although the original *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed.; *DSM-III*; American Psychiatric Association, 1980) ADHD symptom lists have been adapted for *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association, 1994) and *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000) to be more pertinent for different developmental stages up to adulthood (Shaffer, 1996), the definition of the 18 respective *DSM-IV* symptoms as well as the determination of diagnostic thresholds was based on a field trial involving only data about children and adolescents (Applegate et al., 1995). In addition, the thresholds derived for children have been shown to be too restrictive when applied to the same participants as adolescents.

Establishing ADHD-specific and ADHD-pertinent symptoms is complicated further by high comorbidity rates of Axis I and Axis II disorders (Miller, Nigg, & Faraone, 2007), with mood disorder among the most frequent comorbid diagnoses. A consistent result of retrospective studies is that 30% to 50% of adults who meet ADHD criteria have experienced at least one depressive episode (e.g., Kessler et al., 2006). Furthermore, there are inconsistent results regarding the relationship of childhood and adult symptom reports for males and females. While at least in clinical samples, boys markedly outnumber girls (see, for example, Biederman et al., 2005), Murphy and Barkley (1996) observed no impact of gender on reports of current ADHD symptoms obtained from 720 adults applying for a renewal of driver licenses. Yet men recollected them as having occurred in their childhood more often than women.

Most critical is a considerably differing conceptualization of ADHD by both approaches: The *DSM*-based criteria cover three domains, that is, inattention, hyperactivity, and impulsivity, whereas the Wender-Utah approach defines ADHD as involving additional four domains—mood lability, irritability and hot temper, impaired stress tolerance, and disorganization. A diagnosis of adult ADHD according to this approach requires that besides symptoms of inattention and hyperactivity, at least two from the remaining five domains must also have been present. However, dysfunctional behavior as symptoms of hot temper and irritability, mood liability, and impaired stress tolerance also occurs independently of ADHD symptoms (e.g., Barkley, Murphy, & Fischer, 2008) and may represent different developmental outcomes than ADHD. Thus, considering such symptoms as ADHD indicators may lead to confusing ADHD with disorders like oppositional defiant, conduct, or mood disorders. In addition, according to the Wender-Utah approach, not only inattentiveness but also hyperactivity symptoms have still to be experienced in adulthood. As a consequence, individuals diagnosed according to the *DSM* as belonging to a predominately inattentive ADHD subtype will not be recognized according to the Wender-Utah criteria.

Thus, ADHD remains a clinical diagnosis, which is ascertained by relying on clinical experience in gathering and combining signs and symptoms of the disorder. In contrast to children, adults with ADHD appear to be better informants with regard to their symptoms, though the concordance between self-reports and informant reports is lower in patients in their early 20s than in their late 20s or early 30s (compare Barkley et al., 2008). Moreover, adults with ADHD tend to underreport the severity of their symptoms compared with clinicians (Kooij et al., 2008). Against this background, psychometric analyses of self-report ADHD measures should pursue a twofold aim. On a theoretical level, their results are to clarify the conceptual structure of ADHD at issue, by determining the dimensional structure of self-appraised symptoms and by investigating relationships between different facets of ADHD thereby identified and associated disorders. On a practical level, they should contribute to the development of precise and economic ADHD measures, which compose homogeneous subscales suited to assess and discriminate different facets of ADHD. The current practice of using total sum scores from these instruments, despite their probable or already established multidimensionality, may seriously limit the precision of measurement of ADHD symptoms.

With these objectives in mind, we conducted psychometric evaluations of two German versions of ADHD self-report measures based on (a) the *DSM* for identification of current adult ADHD symptoms and (b) the Wender Utah Rating Scale (WURS) for the retrospective assessment of their onset in childhood. Both instruments are components of the "Homburger ADHS scales for adults" (HASE; Rösler, Retz-Junginger, Retz, & Stieglitz, 2008).

The German *DSM*-Based ADHD–Self-Report (ADHD-SR)

The German ADHD-SR (German: ADHS-SB; Rösler et al., 2008) consists of all 18 *DSM-IV* ADHD symptoms (see Table 1). Those symptoms referencing special child situations or activities like school or playing were reformulated to render them more pertinent for adults (e.g., Item 11: "leaves seat in situations in which remaining seated is expected" and Item 12: "runs or climbs excessively in situations in which it is inappropriate"). The occurrence of each symptom has to be judged on a four-categorical answer scale ranging from 0 (*not at all*) to 3 (*very strongly*).

Table 1. ADHD-SR Items, Mean Answer Frequencies, and Factor Loadings From Different CFA

No.	Items	Mean	M3-18	M4-18	M3-15	
Inattention						
A1 a	Fails to give attention to details/makes careless mistakes	.86+	.58	.59	.58	F1
1		.89+	.64	.65	.65	
A1 b	Difficulty sustaining attention	.71+	.66	.67	.68	
2		.70+	.71	.73	.74	
A1 c	Does not seem to listen when spoken to directly	.71+	.62	.63	.59	
3		.80+	.66	.67	.65	
A1 d	Does not follow through on instructions/fails to finish duties in the	.30+	.65	.66	.67	
4	workplace	.32+	.70	.71	.71	
A1 e	Has difficulty organizing tasks and activities	.40+	.50	.51	.50	
5		.60+	.56	.57	.58	
A1 f	Often avoids, dislikes, or is reluctant to engage in tasks that require	.47+	.59	.61	.64	
6	sustained mental effort	.36+	.57	.58	.59	
A1 g	Often loses things necessary for tasks or activities	.74	.37	.54		F4
7		.60	.46	.59		
A1 h	Is often easily distracted by extraneous stimuli	1.26	.73	.74	.73	F1
8		1.08	.73	.74	.74	
A1 i	Is often forgetful in daily activities	.43+	.47	.70		F4
9		.50+	.59	.78		
Hyperactivity						
A2 a	Fidgets with hands or feet or squirms in seat	.58+	.74	.74	.73	F2
10		.40+	.75	.75	.74	
A2 b	Leaves seat in situations in which remaining seated is expected	.37+	.73	.73	.73	
11		.34+	.72	.72	.72	
A2 c	Runs or climbs excessively in situations in which it is inappropriate	.85	.77	.77	.77	
12		1.17	.71	.71	.71	
A2 d	Has difficulty engaging in activities quietly	.20++	.72	.72	.70	
13		.20++	.65	.65	.62	
A2 e	"On the go" or often acts as if "driven by a motor"	.75+	.26	.26		
14		.74+	.42	.42		
Impulsivity						
A2 g	Blurts out answers before questions have been completed	.90	.71	.72	.71	F3
15		.73	.77	.77	.78	
A2 h	Difficulty awaiting turn	.74+	.61	.61	.61	
16		.62+	.75	.75	.74	
A2 i	Often interrupts or intrudes on others (e.g., butts into	.42+	.85	.85	.86	
17	conversations or games)	.29+	.89	.88	.89	
A2 f	Often talks excessively	.56+	.62	.63	.61	
18		.49+	.66	.66	.67	

Note: ADHD-SR = ADHD Self-Report; CFA = confirmatory factor analysis; No.: first line = symptom label in *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*), second line = item number in ADHD-SR; M3-18 = three-dimensional CFA with all 18 *DSM* ADHD symptoms; M4-18 = four-dimensional CFA with all 18 *DSM* ADHD indicators; M3-15 = three-dimensional CFA with 15 psychometric inconspicuous *DSM* ADHD symptoms; + = number of answer categories combined with preceding ones for analyses. 0 = *not at all* to 3 = *very strongly*. Results are from the analysis sample (n = 455; first lines) and the validation sample (n = 1,528; second lines).

The HASE manual does not present a dimensional analysis of this symptom list. Yet the results of item analyses let the constructors to conclude that the 18 items tap the three ADHD dimensions of inattention, hyperactivity, and impulsivity, which have been repeatedly corroborated by dimensional analyses of *DSM*-based self-report instruments in English (compare Barkley et al., 2008). The ADHD-SR sum score was correlated substantially with the sum score from their retrospective WURS–German (WURS-G) version (see later in the article). An ADHD-SR sum score of 18 items discriminated well between 48 patients with a childhood ADHD diagnosis and 40 healthy respondents.

Although the three-dimensional structure of the *DSM* symptoms has been confirmed, it is still at issue to which of its dimensions several symptoms ultimately belong. Item 18 (see Table 1, "often talks excessively"), for example, obtained

equivocal loadings for the dimensions of hyperactivity and impulsivity in a population survey (Kooij, Buitelaar, van den Oord et al., 2005). Item 7 ("often loses things necessary for tasks or activities"), which was not included in *DSM-III*, reached one of the lowest odds ratios among the 15 items in the *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed., revised; *DSM-III-R*; American Psychiatric Association, 1987) field trials (Spitzer, Davies, & Barkley, 1990) and finally was included in *DSM-IV* as a symptom of inattention. Yet according to its face validity, it assesses, like Item 9 ("is often forgetful in daily activities"), primarily absentmindedness, which might occur independently of adult ADHD and thus indicates a related but separate construct.

The Short German Childhood WURS-G

The 25 items of the WURS-G (German: WURS-K) were assembled from the 61 items of the original WURS (WURS-61; Wender, 1971). Selection was guided by face validity, answer frequencies, and item-total correlations derived from the answers of 95 psychiatric, 321 forensic, and 287 healthy respondents ($N = 703$; $M = 35.4$ years; 479 male; Retz-Junginger et al., 2002) to a German translation of the WURS-61. Like the WURS-61, the WURS-G requires adults to retrospectively judge the occurrence of each symptom at the age of 8 to 10 years on five-category answer scales ranging from 0 (*not at all or very slightly*) to 4 (*very much*). A cut score of 30 differentiated 63 male adults who met International Classification of Diseases–10th Revision (ICD-10) and *DSM-IV* criteria for ADHD from 1,303 controls (Retz-Junginger et al., 2003).

The WURS-G is not just a translation of the WURS-25 compiled by Ward et al. (1993) from the WURS-61, though it also comprises also 25 items. Instead, it uses only 21 of the WURS-61 items and 17 of the WURS-25 as ADHD indicators (see Table 2). The remaining 4 items are positively worded (e.g., well organized, tidy, neat) and are included merely as control items to identify careless responders.

The WURS has also been translated into various other languages and administered in several countries (compare Caci, Bouchez, & Baylé, 2010; Fossati et al., 2001; Öncü, Ölmez, & Sentürk, 2005). However, its factorial structure was investigated, only in few studies, relying on different item sets and leading to inconsistent results about the number of factors and the formal validity of the single WURS indicators.

Dimensional Structure of the WURS

McCann, Scheele, Ward, and Roy-Byrne (2000) administered the WURS-25 to 143 adults evaluated for ADHD in a specialty clinic, once in its traditional retrospective form (WURS-C) and additionally in a form referencing the present (WURS-A). Principal components analyses (PCA) led to three equivalent components for both forms (see Table 2): school/work problems, including the inattention and hyperactivity items; dysthymia; and oppositional defiant behavior. According to component loadings <.50, observed for both WURS measures, two items did not fit well into this solution ("tend to be immature" and "trouble seeing things from someone else's point of view"). Two further items belonged to different components in the WURS-C and in the WURS-A (see Table 2). Three factors were also reported by Fossati et al. (2001).

Retz-Junginger et al. (2002) subjected the answers to the items of the WURS-G obtained from the samples described above to a PCA. Five components were retained and labeled as (a) attention deficit/hyperactivity, (b) impulsivity, (c) anxious-depressive symptomatology, (d) oppositional defiant behavior, and (e) social adaptation disorder. Extraction criteria and component loadings for the items were not reported. Caci et al. (2010) investigated the psychometric properties of French translations of the WURS-25 and of the 17 WURS-G items contained also in the WURS-25 (149 university students, 280 parents of ADHD children). By means of PCA, they extracted three components each for the WURS-25 and the WURS-G items. The first two dimensions were labeled as inattentiveness and impulsivity/temper. The third WURS-25 dimension was named mood/self-esteem, but the third WURS-G factor was labeled antisocial behavior. The latter was associated mainly with the WURS-61 items not contained in the WURS-25. Several identical items were allocated to different factors in both instruments and also had rather low factor loadings, that is, were little formally valid (see Table 2). Two further dimensional analyses of the WURS-25 reported five-factor solutions (Norvilitis, Ingersoll, Zhang, & Shuhua, 2008; Öncü et al., 2005).

Across all factor analytic studies, only the inattention dimension and the affective lability and impulsivity dimension have been rather consistently found. Thus, the WURS apparently does reflect problems with the concept of ADHD as embodied in the Wender-Utah criteria and is additionally afflicted by ambiguous operationalizations of single symptoms: Several of its items apparently refer not only to one but also potentially to two or more Wender-Utah criteria facets (e.g., Item 8: "disobedient with parents, rebellious, sassy," Item 17: "tend to be or act irrational," Item 19: "afraid of losing control of self") or reflect direct dependencies between symptoms assessed by different items (e.g., Item 24: "overall a poor student . . ." represents a consequence of core ADHD symptoms).

Research Objectives

We will pursue three major questions in our study: First, "How does the dimensional structure of the retrospective

Table 2. Items of the WURS-21-G, Their Factor Associations According to Previous Studies, and Their Answer Means According to Own Study

No.	Items	MC	RJ	CACI	*M*
1	Concentration problems, easily distracted (3)	SWP	IH	INA/INA	.78+ .76+
2	Nervous, fidgety (5)	D	IH	IMP/IMP/ FL=.34	.77+ .66+
3	Inattentive, daydreaming (6)	SWP	IH	INA/INA	.90+ .94+
5	Temper outbursts, tantrums (9)	ODB	IMP	IMP/IMP	1.12+ .70+
6	Not following through, failing to finish (10)	SWP	IH	INA/INA	.81+ .58+
7	Sad or blue, depressed, unhappy (12)	D	(A)D	MO/IMP	.66+ .56+
8	Disobedient with parents, rebellious, sassy (15)	ODB	P	IMP/AS	.84+ .66+
9	Low opinion of myself (16)	D	(A)D	MO/IMP	1.32 1.35
10	Irritable (17)	D	IH	IMP/IMP	1.26+ 1.18+
11	Moody, have ups and downs (20)	D	IMP	IMP/IMP	.88+ .73+
13	Feel angry (21)	ODB	IMP	IMP/IMP	.88+ .69+
15	Tend to be immature (25)	FL < .50	IH	INA/INA FL < .50	.78+ .63
16	Lose control of myself (27)	ODB/D	IMP	IMP/IMP	.57++ .45++
17	Tend to be or act irrational (28)	ODB	IH	IMP/IMP	.83+ .65+
18	Unpopular with other children, did not keep friends for long . . . (29)	ODB/D	(A)D	MO/IMP FL < .35	.62+ .55+
19	Afraid of losing control of self (31)	—	(A)D	—/IMP FL < .50	.29++ .28++
20	Ran away from home (34)	—	S	—/AS FL < .50	.18+++ .13++
21	Got in fights (35)	—	P	—/AS	.57++ .36++
22	Trouble with authorities . . . (41)	SWP	P	INA/AS	.33++ .25++
23	Trouble with the police, booked, convicted (42)	—	S	—/AS	.05+++ .04+++
24	Overall a poor student . . . (51)	SWP	IH	INA/INA	.15+++ .17+++

Note: WURS–German = Wender-Utah Rating Scale–German; NO. = Item number in WURS-21-G; MC = McCann, Scheele, Ward, and Roy-Byrne (2000): SWP = school/work problems, D = dysthymia, ODB = oppositional/defiant behavior; RJ = Retz-Junginger et al. (2002): IH = inattention (attention disorder)/hyperactivity, IMP = impulsivity, (A)D = (Anxious-)depressive symptomatology, P = protest behavior, S = social adaptation disorder; CACI = Caci, Bouchez, and Baylé (2010): WURS-25 und WURS-21-G: INA = inattentiveness; IMP = impulsivity/temper; WURS-25—MO = mood/self-esteem; WURS-21-G—AS = antisocial behavior; FL = factor loading; + = number of answer categories combined with preceding ones for analyses. 0 = *not at all or very slightly* to 4 = *very much*. Number in parentheses after item texts = item number in WURS-61 and WURS-25. Results are from the analysis sample (n = 455; first lines) and the validation sample (n = 1,528; second lines).

WURS-G and of the *DSM-IV*-based ADHS-SR for adults compare with their counterparts in previous studies?" In pursuing this question, it will also be explored if apparently weakly formally valid symptoms can be dropped from these measures without omitting ADHD-relevant information. This should lead to homogeneous subscales as well as

better discriminating measures. In addition, any saving in length should facilitate their administration, especially in general population surveys; as for an assessment of adult ADHD, two measures have to be used. Finally, because there are inconsistent results regarding the relationship of childhood and adult symptom reports for males and females, we examine whether gender influences the answers to and the factorial structures of both measures.

Second, we will clarify the conceptual structure of ADHD by addressing the following question: "Does the WURS-G aid as intended in the establishing of adult ADHD?" As outlined above, the Wender-Utah criteria have been criticized for including symptoms that should not be considered as core ADHD symptoms but as belonging to other disorders frequently comorbid with ADHD (e.g., conduct disorder, depressivity). If those symptoms were part of the ADHD syndrome, they should forecast current ADHD symptoms as well as the core symptoms of inattention and hyperactivity contained in the WURS. If so, their predictive utility should be comparable with that of the core items. Thus, the dimensions identified for the WURS-G are used as predictors of observed adult ADHD, that is, ADHD-SR dimensions in a structural equation model (SEM).

Third, as an additional predictor, adult depressivity is included in this model. On one hand, as mentioned above, depression is assumed to be one of the most frequent comorbid disorders of adult ADHD. On the other hand, symptoms pertinent to depression are also part of the WURS though they have no counterpart in the *DSM* ADHD symptom lists. Therefore, we will examine (a) if the answers to a pertinent measure of adult depressivity are forecast by levels on WURS dimensions and (b) whether they contribute systematically to the variance in reports of present ADHD symptoms over and above that accounted for by retrospectively appraised childhood symptoms surveyed by the WURS-G. This strategy should expose those purported WURS ADHD facets that are not associated with present ADHD symptoms and thus will bear on the conceptualization of adult ADHD.

The population studied was university students. In Germany, about 50% of the students who graduate from high school will enroll at a university. Considering the thresholds in our school system, which students have to hurdle to enter the university, the prevalence and severity of ADHD symptoms might be rather low in this study population. However, due to their low age at entry (about 19 years), students might still have comparatively high ADHD rates (Heiligenstein, Conyers, Berns, & Smith, 1998), and ADHD symptoms might still cause severe academic problems in them. Thus, students may be rather aware of their symptoms, even if these were less severe than in people with an ADHD diagnosis not enrolled. Epidemiological studies indicate that between 2% and 8% of the college population report clinically significant levels of ADHD symptoms that are clearly associated with deficits in academic achievement and scholastic success (review by Du Paul, Weyandt, O'Dell, & Varejao, 2009).

Two student samples were used. The first one served as analysis sample. Data from a second much larger sample were involved for replication of all analyses critical for decisions about the dimensionality of both instruments as well as their structural relationships with each other, with adult depressivity and with gender.

Method

Recruitment Procedures and Samples

Analysis Sample (S1). In 2005, 8,102 students were randomly selected from a total of 40,000 students enrolled at the University of Muenster (Germany) and were invited to take part in an online survey about study problems. A total of 851 students from 10 different study branches participated (response rate of 21%). After filling out a short questionnaire on procrastination, the students were requested to answer more questionnaires dealing with difficulties in organizing one's studying. In all, 473 of the 851 followed this invitation. Among them, 15 gave inconsistent demographic information. Thus, the data of 458 students were retained for statistical analyses. A total of 299 (65%) students were female. The students' age ranged from 20 to 47 years ($M = 24.6$; $SD = 3.4$). When the WURS-G and the ADHD-SR cut scores were applied separately, 9.7% and 14.7% of the respondents, respectively, were at risk for ADHD. Combining both cut scores reduced this rate to 4.8%.

Replication Sample (S2). In 2010, 4,500 e-mail accounts of students enrolled at the University of Muenster were randomly selected. Students were invited and asked to take part in a survey assessing problems in study organization and time management. A total of 1,528 students participated, that is, 34% of all contacted. In all, 975 (63.8%) of them were female. The students' age varied between 18 and 35 years ($M = 22.7$; $SD = 2.4$). In both online surveys, items could not be skipped, thus no missing values occurred. A separate application of WURS-G and the ADHD-SR cut scores identified 7.7% and 14.9% of respondents, respectively, as at risk for ADHD. Combining both cut scores reduced this rate to 3.6%.

Measures

Adult and childhood ADHD symptoms. In all, 18 *DSM* symptoms were presented in the German ADHD-SR and 21 Wender-Utah criteria of the WURS-G. Both measures were described in detail previously.

Adult depressivity. The nine-item Patient Health Questionnaire (PHQ-9) is a well-validated subscale of the PHQ

(Löwe et al., 2004). Its nine items assess the presence of common depressive symptoms according to *DSM-IV* during the past 2 weeks (e.g., loss of interest or pleasure, sleeping problems, trouble concentrating) by means of an answer scale with four categories (*not at all* = 0 to *nearly everyday* = 3; range of the PHQ-9 total score = 0-27).

Statistical Analyses. All previous investigations used conventional linear dimensional analyses to identify the factorial structure of the answers to the ADHD-SR and the WURS-G. However, like many other self-report measures, both instruments provide only five and four ordinal answer categories, respectively, for which the assumption of equidistance is questionable. Thus, answers obtained with these scales probably are not linearly related to their underlying dimensions. In addition, especially in nonclinical samples, answer distributions for symptom ratings generally are skewed. Therefore, all analyses reported here used nonlinear confirmatory factor analysis (CFA) and SEM models specifically developed for an appropriate handling of binary- and ordinal-dependent variables.

The type of model applied here is a two-parameter (2P) item response theory model (compare Glöckner-Rist & Hoijtink, 2003). It analyzes tetrachoric or polychoric correlations estimated on the basis of the matrix of the answer covariance. Muthén (2002) has integrated this model class in a generalized SEM framework. It can be computed with Mplus (http://www.statmodel.com), which was therefore used for all our analyses (Version 6.1). First, relying on the data of the first sample, different measurement models for the ADHS-SR were tested, starting with a CFA positing the three-dimensional structure of ADHD symptoms stipulated by *DSM-IV*. In a second step, CFA models specifying different dimensional solutions suggested by previous studies for the WURS were computed and compared. In both these measurement analysis steps, the data from the larger second sample were analyzed additionally, to support critical decisions about the number of factors and the dimensional affiliation of single items. Finally, gender was included as a covariate in the theoretically and statistically most convincing measurement model.

To explore the construct validity of the WURS-G dimensions, in a third step, a SEM model was tested, in which the WURS-G dimensions served as direct predictors of adult ADHD dimensions and adult depressivity, with adult depressivity as a second predictor of adult ADHD facets. WURS-G dimensions are thus considered as potential indirect predictors of adult ADHD dimensions via their possible relationship to adult depressivity. In addition, gender was involved as a covariate with a direct impact on all constructs.

All results from these analyses are based on robust mean- and variance-adjusted weighted least squares (WLSMV) estimation. For a statistical evaluation of model fit, chi-square values for overall goodness of fit are reported, although they too often suggest model rejections in large samples. As descriptive fit indices, the comparative fit index (CFI), the Tucker–Lewis Index (TLI), and the root mean square error of approximation (RMSEA) are considered. According to common decision criteria, an acceptable and good fit, respectively, requires the first two indices to have values >.90 and >.95, respectively, and for the RMSEA to have values <.10 and close to .05, respectively (compare Bollen, 1989).All statements about significant differences between nested models are based on a special chi-square difference test for WLSMV provided by Mplus.

Results

Answer Frequencies for the ADHD-SR and WURS Items

For ease of interpretation, Tables 1 and 2 depict the mean instead of the analyzed categorical answer frequencies for each of the ADHD-SR and WURS-G items from the analysis and replication sample.

For most items of both measures, one or two of the high-intensity categories were endorsed by less than 5% of the respondents. As all CFA conducted involve chi-square-based computations, such categories were combined with their adjacent ones until the criterion of at least 5% of observations per cell was obtained. Among the ADHD-SR items (see Table 1), Item 8 ("is often easily distracted by extraneous stimuli") is the one most often affirmed, that is, the easiest one, and Item 13 ("has difficulty engaging in activities quietly") is the least frequently endorsed, that is, the most difficult one. As expected for the WURS, Items 23 ("trouble with the police, booked, convicted"), 20 ("ran away from home"), and also 24 ("overall a poor student . . . ") are the most difficult ones, whereas the Items 9 ("low opinion of myself") and 10 ("irritable") are the easiest (see Table 2).

Measurement Model Analyses

ADHD-SR Answers. Table 1 presents the results of a CFA specifying the three dimensions inattention, hyperactivity, and impulsivity as structuring the answers to the 18 *DSM* ADHD symptoms. In this analysis, Item 18 ("often talks excessively") is clearly associated with impulsivity instead of with inattention. According to the RMSEA (see Table 3), this solution is acceptable for the data from both samples. Yet the CFI and TLI each indicate that it does not satisfactorily explain the answer covariance of the 18 *DSM* symptoms in the analysis sample. According to the factor loadings (see Table 1), Items 9 ("is often forgetful in daily activities") and 7 ("often loses things necessary for tasks or activities") are related rather weakly to their target factor inattention. Item 14 ("on the go" or often acts as if "driven by a motor") also correlates only weakly with its target

Table 3. Overall Fit Indices for Different ADHD-SR and WURS-G CFA Models in the Analysis

Measurement models	Description	χ^2	*df*	CFI	TLI	RMSEA
ADHD-SR-18	3 dim	356.7	132	.90	.89	.06
		746.1	132	.94	.93	.06
ADHD-SR-18	4 dim	326.0	129	.92	.90	.05
		587.2	129	.95	.94	.05
ADHD-SR-15	3 dim	192.3	87	.95	.94	.05
		415.9	87	.96	.95	.05
WURS-21	5 dim Retz-Junginger et al., 2002	747.8	179	.90	.88	.08
		1,917.1	179	.93	.91	.08
WURS-21	4 dim (items as previous)	758.4	183	.90	.86	.08
		1,865.0	183	.93	.92	.08
WURS-21	4 dim (new)	651.8	183	.92	.91	.07
		1,620.6	183	.94	.93	.07
WURS-15	4 dim	276.1	84	.96	.95	.06
		580.9	84	.97	.96	.06
Structure models		1,368.1	714	.93	.92	.04
		2,922.4	714	.93	.93	.04

Note: ADHD-SR = ADHD Self-Report; WURS-G = Wender Utah Rating Scale–German; CFA = confirmatory factor analysis; CFI = comparative fit index; TLI = Tucker–Lewis Index; RMSEA = root mean square error of approximation; dim = dimensions. Results are from the analysis sample (n = 455; first lines) and the validation sample (n = 1,528; second lines).

factor hyperactivity. These three items yield the weakest formal validity in the replication sample too. Items 7 ("often loses things necessary for tasks or activities") and 9 ("is often forgetful in daily activities") appear to describe instances of absentmindedness more than of inattention. Therefore, they were specified as indicators of an additional fourth latent variable in a further CFA. This elaboration did enhance overall model fit in both samples (see Table 3) but did not strengthen the association of Item 14 ("on the go" or often acts as if "driven by a motor") with hyperactivity (see Table 1). Therefore, these three items were excluded from a further CFA, hypothesizing again that the remaining items tap three factors. This model explains the answer covariance in both samples sufficiently according to all three descriptive fit indices (see Table 3) and leads to almost identical or even better factor loadings for the 15 items retained (see Table 1). For the long and the short version and both samples, the correlations between inattention and impulsivity ranged from .46 to .52, between inattention and hyperactivity ranged from .57 to .68, and between impulsivity and hyperactivity ranged between .61 and .64.

Adding gender (*female* = 0; *male* = 1) as a covariate in the model either with all 18 or with only 15 items led to almost identical results. Gender had a significant, though weak, positive impact on inattention in both samples (.16 and .22). Only in the replication sample did it influence hyperactivity and impulsivity reports, yet in opposite directions (.24 and −.28).

WURS Answers. A five dimensional CFA model positing the PCA solution of Retz-Junginger et al. (2002; see Table 2) proved to be amendable according to the solutions for both samples (see Table 3). This was true also for a model in which the fifth and the fourth factor were combined, while all other factor-indicator associations were specified as stated by Retz-Junginger et al. A different CFA was performed with the same four dimensions inattention/hyperactivity, affect lability, depressivity, and conduct problems but with partly different factor-indicator associations (see Table 4). For these allocations, we relied on the modification indices and on the face validity of the items. This model did yield a better fit (see Table 3; four dimensions [new]) for both samples. However, it still did not explain the answer covariance satisfactorily, apparently due to structural problems caused by six items. Five of them can be exchanged between two or more factors with almost equal factor-indicator associations and without marked changes in overall model fit indices: Items 17 ("tend to be or act irrational") and 15 ("tend to be immature"), assumed to belong to Factor 4 in Table 4 (conduct problems), were associated almost equally strongly to Factor 1 (inattention) when specified accordingly. Conduct disorder indicator Item 8 ("disobedient with parents, rebellious, sassy") could be moved to Factor 2 (affect lability/dysregulation), as it also refers to having been sassy or rebellious besides having been disobedient. Item 19 ("afraid of losing control of self") of Factor 2 (affect lability/dysregulation) could also be allocated to Factor 4 (conduct problems), apparently because it addresses a probable cause of behavior problems. Depressivity indicator, Item 10 ("irritable") is also strongly related to the inattention/hyperactivity indicators, probably because "irritable" at least in German means not only to be short-tempered/testy but also to be

Table 4. Factor Loadings From CFA of the Answers to the WURS-21- and WURS-15-G

		WURS-21		WURS-15	
No.	Item	S1	S2	S1	S2
F1: Inattention/hyperactivity					
1	Concentration problems, easily distracted (1)	.88	.85	.89	.86
6	Not following through, failing to finish (10)	.82	.83	.81	.82
2	Nervous, fidgety (5)	.80	.81	.79	.81
3	Inattentive, daydreaming (6)	.80	.81	.80	.81
24[a]	Overall a poor student ... (51)	.70	.70	—	—
F2: Affect lability/dysregulation					
11	Moody, have ups and downs (20)	.84	.86	.87	.88
13	Feel angry (21)	.82	.86	.83	.87
16	Lose control of myself (27)	.87	.90	.84	.86
5	Temper outbursts, tantrums (9)	.73	.81	.74	.82
19[a]	Afraid of losing control of self (31)	.69	.77	—	—
F3: Depressivity					
7	Sad or blue, depressed, unhappy (12)	.85	.87	.95	.92
10[a]	Irritable (17)	.81	.79	—	—
18	Unpopular with other children, did not keep friends for long ... (29)	.71	.69	.74	.70
9	Low opinion of myself (16)	.65	.74	.65	.71
F4: Conduct problems					
17[a]	Tend to be or act irrational (28)	.81	.81	—	—
8[a]	Disobedient with parents, rebellious, sassy (15)	.74	.84	—	—
22	Trouble with authorities ... (41)	.74	.74	.91	.91
23	Trouble with the police, booked, convicted (42)	.67	.58	.75	.70
21	Got in fights (35)	.61	.59	.71	.71
15[a]	Tend to be immature (25)	.61.	.70	—	—
20	Ran away from home (34)	.58	.54	.68	.69

Note: CFA = confirmatory factor analysis; WURS-G = Wender Utah Rating Scale–German; No = item number in WURS-21-G. Number in parentheses after item texts = item number in WURS-61 and WURS-25. Results are from the analysis sample (n = 455; first lines) and the validation sample (n = 1,528; second lines).
[a]Eliminated items.

easily distracted. Finally, Item 24 ("overall a poor student . . ."), which is the one associated the least with Factor 1 (inattention/hyperactivity), describes rather a consequence instead of a core symptom of inattention/hyperactivity.

In part, these six items proved ambiguous or little formally valid already in the three studies cited previously (see Table 2). Dropping them therefore from a further four-dimensional CFA did not worsen but improve the fit to the data of both samples (see Table 3). Furthermore, it enhanced the formal validity of most of the remaining 15 items again in both samples (see Table 4), especially those of the conduct problems indicators. For this WURS-15 version, the four WURS dimensions identified in both samples are substantially and positively correlated, though markedly lower than in the model with all 21 WURS-G indicators. The lowest correlations are obtained for childhood depressivity and conduct problems (.20 and .31), whereas all others vary between .42 and .65. Furthermore, all dimensions but childhood depressivity were significantly and negatively affected by gender, with the lowest impact on affect lability (−.14 each) and a stronger influence on inattention/hyperactivity (−.27 and −.30) and conduct problems (−.30 and −.33).

Relationship of Childhood ADHD Dimensions to Adult ADHD Symptoms and Adult Depressivity. The patterns of significant and insignificant results were the same for the 21- and 15-item versions. Thus, we focus on the more discriminative and economic 15-item version. According to the respective regression coefficients for direct (main) effects for both samples in Table 5, none of the adult ADHD facets is systematically influenced by WURS-15-G conduct problems. Childhood depressivity influences significantly and positively adult depressivity. Yet, it exerts no direct impact on adult inattention, and it varies negatively with adult hyperactivity and impulsivity only according to the data of the smaller analysis sample. However, WURS-G inattention/hyperactivity predicts both adult inattention and hyperactivity and to a lesser degree also impulsivity. Childhood

Table 5. Significant Standardized Coefficients (Estimation Errors) for Adult ADHD Dimensions Regressed on Child ADHD Dimensions and Adult Depressivity, and Adult Depressivity Regressed on Child ADHD Dimensions

		Criterion variables			
		Adult (ADHD-SR)			Adult (PHQ)
Predictor variables	Effects	Inattention	Hyperactivity	Impulsivity	Depressivity
Childhood (WURS-15-G)					
Attention deficit/hyperactivity	Direct	.50 (.04)** .31 (.02)**	.65 (.07)** .44 (.03)**	.34 (.08)* .18 (.04)*	— .12 (.03)*
	Indirect	—	—	—	—
Affect lability/dysregulation	Direct	—	—	.21 (.09)* .24 (.04)**	—
	Indirect	—	—	—	—
Depressivity	Direct	—	−.32 (.12)* —	−.28 (.12)* —	.43 (.07)** .33 (.04)**
	Indirect	.21 (.04)** .21 (.02)**	.24 (.06)** .19 (.02)**	.21 (.04)* .07 (.03)**	—
Conduct problems	Direct	—	—	—	—
	Indirect	—	—	—	—
Adult (PHQ-9)					
Depressivity	Direct	.49 (.05)** .66 (.03)**	.55 (.07)** .63 (.04)**	.28 (.07)** .21 (.04)**	

Note: ADHD-SR = ADHD Self-Report; PHQ = Patient Health Questionnaire; WURS-G = Wender Utah Rating Scale–German. Results are from the analysis sample (n = 455; first lines) and the validation sample (n = 1,528; second lines). Indirect effects = impact of WURS-15-G dimensions on Adult ADHD dimensions via adult depressivity (PHQ-9). Not significant regression coefficients were fixed to zero. Gender was involved as an additional covariate.
*$p < .05$. **$p < .01$.

affect lability forecasts adult impulsivity but none of the other ADHD facets.

Association of Childhood and Adult Depressivity With Adult ADHD Facets. Does adult depressivity contribute to the variance in present ADHD symptoms over and above that accounted for by retrospectively appraised childhood ADHD symptoms? Adult depressivity, which is itself predicted by childhood depressivity, well predicts adult inattention, and hyperactivity as well as impulsivity, though to a markedly lesser degree, especially in the replication sample. Thus, it accompanies all adult ADHD symptoms, and retrospectively perceived depressive symptoms correspond well to present ones. Obviously, the WURS-15 and the PHQ-9 assessments of depressive symptoms tap the same domain.

The indirect effects shown in Table 5 tell us to which extent adult depressivity explains variance in adult ADHD facets, in addition to the direct influence of the retrospectively assessed ADHD dimensions. Childhood depressivity significantly enhances reports of all adult ADHD facets indirectly via its association with adult depressivity.

Finally, the SEM models indicated comparable associations between gender and WURS-G and ADHD-SR dimensions as the respective measurement analyses.

Discussion

For the ADHD-SR, the expected three dimensions of adult inattention, hyperactivity, and impulsivity were confirmed in both student samples. However, the answers to several items were not well explained by this factorial structure: Item 18 ("often talks excessively," see Table 1) was primarily associated with adult impulsivity instead of with hyperactivity as suggested by *DSM-IV*. This corroborates the uncertain stance of this symptom observed in a previous study (Kooij et al., 2005). Item 7 ("often loses things necessary for tasks or activities"), which was found to be little reliable already in the *DSM-III-R* field trials (Spitzer et al., 1990) did not relate well to the inattention dimension. The same was true for Item 9 ("is often forgetful in daily activities"). According to a four-dimensional CFA of the data of both samples, both items apparently belong to a separate factor interpretable as absentmindedness. Furthermore, Item 14 ("on the go" or often acts as if "driven by a motor") proved to be only a weak indicator of hyperactivity. In neither sample did elimination of these three items worsen model fit or the formal validity of the remaining 15 adult ADHD indicators in both samples. On one hand, in the interest of practicability, these observations justify to shorten the list of adult ADHD symptoms without losing

information. On the other hand, they bear on the discussion on how to operationalize ADHD in *DSM-V*. In particular, they suggest to prune two symptoms from the list of inattention symptoms. Moreover, the symptom "talks excessively" should be treated as impulsivity indicator instead of as hyperactivity indicator. This corresponds to the aim of increasing the comparably low number of indicators for this domain in the proposed *DSM-V* (compare *DSM-V*; http://www.dsm5.org/Proposed Revisions/Pages/proposedrevision.aspx?rid=383).

CFA of the answers to the WURS-G confirmed their four-dimensional structuring in inattention/hyperactivity, affect lability, depressivity, and conduct problems. At first sight, this dimensional result diverges from all solutions suggested by previous studies. However, our first three factors correspond to the first three components identified by Retz-Junginger et al. (2002) and the fourth, conduct problems, identified also by Caci et al. (2010), is in part a combination of their two components of oppositional defiant behavior (see Table 2). In addition, it contains Items 8 ("disobedient with parents, rebellious, sassy") and 17 ("tend to be or act irrational"), which were allocated also to this factor in the study of McCann et al. (2000).

The different results could be due to several divergent characteristics of our and previous studies, for example, the samples surveyed and the methods used (nonlinear CFA instead of linear PCA). Yet the most probable reason for this instability of dimensional solutions is that according to the data of both of our student samples, five items of the WURS-G clearly proved to be multidimensional (Item 19: "afraid of losing control of self," Item 10: "irritable," Item 17: "tend to be or act irrational," Item 8: "disobedient with parents, rebellious, sassy," and Item 15: "tend to be immature"; see Table 2); that is, they could be allocated almost equally well to two than only one of the four WURS factors, apparently because they refer to several concept domains (e.g., Item 17: "tend to be or act irrational," Item 8: "disobedient with parents, rebellious, sassy") or involve ambiguous terms (e.g., Item 10). For a sixth item (Item 24: "overall a poor student . . .") with the lowest reliability among the inattention/hyperactivity items, it is questionable whether it truly indicates this ADHD facet. Rather, it is just a consequence of inattention. Removal of these six items, which in part proved to be critical also in previous studies, enhanced the fit of our four-dimensional model to the data of both samples and in part, the formal validity of the remaining 15 indicators.

As to the relationship between WURS dimensions and ADHD-R dimensions, three results regarding the direct effects obtained in our SEM analysis are remarkable: First, the WURS factor inattention/hyperactivity has a positive impact on all three adult ADHD dimensions, whereas affect lability forecasts only adult impulsivity. Thus, these two WURS factors relate to adult ADHD in a way that confirms their conceptual similarity to core adult ADHD symptoms. Second, WURS conduct disorders, though associated positively and substantially with the other three WURS dimensions, do not predict any of the three adult ADHD dimensions. This supports the suspicion that the respective WURS items do not operationalize ADHD core symptoms but are indicators of often associated, but clearly separate, childhood disorders. For the larger sample, analogous results were obtained for childhood depressivity: It correlates substantially and positively with the remaining WURS dimensions but is not associated with any of the adult ADHD dimensions. In the smaller sample, childhood depressivity even has a direct negative effect on adult hyperactivity and impulsivity symptoms: For students in this sample, more recollected childhood symptoms of depression went together with fewer adult hyperactivity and impulsivity symptoms. Yet, again in both samples, previous and current depressivity are substantially and positively related. This nourishes the second suspicion that not only WURS conducts problems but also depressivity taps facets different from core ADHD facets.

This suspicion is further bolstered by the following observations about the contribution of adult depressivity to the variance in present ADHD and retrospectively appraised WURS symptoms. The more adult depressivity is reported, the more adult inattention and hyperactivity symptoms are reported, too. This is true also for adult impulsivity, though in both samples the respective relationships are less pronounced. From among the WURS factors, childhood depressivity predicts adult depressivity substantially and consistently in both samples. In addition, childhood attention deficit/hyperactivity reports increases adult depressivity reports but via a comparatively weak association solely in the replication sample. In accord with these relationships, only WURS childhood depressivity and none of the other WURS dimensions significantly influences adult ADHD indirectly via its relationship to adult depressivity.

The strong association of current depressivity with all adult ADHD facets corresponds to the known high comorbidity of depression with ADHD. To a certain extent, it is apparently due to an overlap of ADHD symptoms and depression symptoms (Milberger, Biederman, Faraone, Murphy, & Tsuang, 1995). Thus, the strong direct effects of current depressivity on adult ADHD symptom reports describe a systematic covariation of the number of ADHD symptoms and of depression symptoms endorsed but clearly are not to be interpreted to imply a functional dependency of ADHD symptoms on depressivity. On one hand, the direct effect of childhood depressivity on present depressivity might reflect a bias toward reporting more childhood depressive symptoms if asked for in the presence of current depressive symptoms. On the other hand, there is evidence of the stability of mood and anxiety symptoms from childhood across adolescents into early adulthood: According to prospective studies, most

anxiety and depressive disorders in young adults are preceded by anxiety or depression in adolescence (Pine, Cohen, Gurley, Brook, & Ma, 1998). The strong association of past and present depressivity and the strong association of present depressivity to adult ADHD facets allow childhood depressivity reports to indirectly enhance adult ADHD reports via this route. Gender had a week impact on both ADHD measures: Males reported fewer childhood ADHD symptoms and more adult ADHD symptoms than did females, except higher reports of adult impulsivity in females in the replication sample. As effects were small and partly inconsistent, they seem to reflect sample variability rather than a consistent impact of gender on subjective reports.

To summarize, the results of dimensional analyses vary considerably more for the WURS than for *DSM*-based adult ADHD symptom lists across studies. This lack of robustness of the dimensional structure of the WURS most probably is due to the multidimensionality and low formal validity of several of the WURS items. Consequently, the WURS dimensions composed of these items are heterogeneous and do not fulfill the criteria for measuring homogeneous constructs. This impedes dimensional solutions which are robust across samples and methods. Our results taken together with the results of previous studies thus suggest major revisions of the WURS-G. First, a number of items should be dropped (see Table 4) to achieve homogeneous constructs which would make further attempts at construct validation more fertile. Second, including the depressivity and the conduct disorder items in a sum score as suggested for the application of the WURS will reduce the validity of the scale for assessing ADHD. Neither the items allocated to the conduct disorder dimension nor the items of the depressivity dimension assess core symptoms of ADHD but those of comorbid conditions. This is immediately apparent for the conduct problems tapped by the WURS because they do not relate systematically to any of the three adult ADHD dimensions. Yet it also holds for the WURS depressivity items, which are negatively related to adult ADHD symptom reports, when their relationship to adult depressivity is controlled. Endorsement of the conduct problems indicators and of the depressivity items of the WURS does not correspond to enhanced present ADHD symptoms. Thus, both facets should not be included in sum scores for the assessment of past ADHD symptoms.

Limitations of this study are due to the general constraints of a cross-sectional retrospective study, to the exclusive use of the WURS-G and the ADHD-SR, to their application to student samples, and to the lack of established ADHD diagnoses. By comparing these two instruments, we followed the procedure of clinical routine applications as, for example, suggested in the HASE manual (Rösler et al., 2008). However, to exhaustively study the relationships between WURS and ADHD-SR dimensions, we should have used an adult version of the WURS also. Then we could have traced the relationship of childhood symptom reports in the WURS via its adult counterpart to the adult symptom reports obtained with the ADHD-SR. We expect that this expansion would have shown that the WURS dimensions of negative affect and of conduct disorders are consistent from the childhood to the adult version, but again no regression path would have been found to adult core ADHD symptoms. However, only a prospective study would have allowed to gauge the extent of bias in retrospective reports of ADHD symptoms and to depict the developmental changes of symptoms from childhood to adulthood. The lack of childhood and adult diagnoses of ADHD is a further limitation: ADHD diagnoses would have allowed the reporting of precise prevalence rates of ADHD in these student samples. Also, structural analyses of the symptom reports could have been repeated for diagnosed respondents only, to check whether the dimensional solutions would be valid for a clinical population.

As discussed in the introduction, student samples probably have a lower prevalence of ADHD symptoms than found in the general population. Also, as Glutting, Youngstrom, and Watkins (2005) noted, college students with ADHD are likely to have higher ability levels and better compensatory skills than individuals with ADHD in the general population. In children, academic achievement is negatively associated with ADHD symptoms, in particular symptoms of inattentiveness (Polderman, Boomsma, Bartels, Verhulst, & Huizink, 2010).Thus, children with this impediment will have difficulties to get access to higher education, and as a consequence, student ADHD samples may also be composed differently than are ADHD samples from the general population. The net effect of these selection effects will be a reduction in the variance of ADHD symptoms in student samples. This limits the strength of associations to be found among ADHD symptoms and related constructs. However, as this is a conservative consequence, it is safe to assume that similar structural solutions will be found in general populations samples.

Although the results obtained from both samples were mostly comparable, differences, for example, with respect to the direct effects of childhood depressivity on adult ADHD symptoms were apparent. We assume that these are due to differences in the recruitment procedure: Only the analysis sample was gained in a two-step procedure by inviting students to respond to further questionnaires after a screening for procrastination. This may have attracted persons with work problems, who would also be prone to ADHD symptoms.

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