



ORIGINAL ARTICLE

# Subjective Distress Associated with Adult ADHD: evaluation of a new self-report

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**Abstract** The current study aims at documenting the psychometric properties of the Subjective Distress Associated with Adult ADHD-Self-Report (SDAAA-SR), a newly developed instrument for the assessment of psychological suffering in ADHD adults. The SDAAA-SR was administered to 247 students and 142 ADHD adults. Factor structure, internal consistency, test-retest reliability, convergent validity and discriminant validity were assessed. Sensitivity to change was examined in a subsample of 25 ADHD patients who participated in a 1-year therapy. The initial pool of 62 items was reduced to 33 items distributed in a three-component structure. Internal consistency was excellent for the “distress due to inattention/disorganization” subscale and good for the “distress due to hyperactivity/impulsivity” and “distress due to self-esteem deficit” subscales. Test-retest reliability in a subsample of 98 students was substantial for all three subscales. ADHD patients scored significantly higher than students on distress due to “inattention/disorganization” and “hyperactivity/impulsivity,” but no difference was observed for “self-esteem deficit.” The components “inattention/disorganization” and “hyperactivity/impulsivity” displayed moderate to large correlations with the corresponding

dimensions of the Adult Self-Report Scale for ADHD (ASRS-V1.1). Distress due to “inattention/disorganization” and “self-esteem deficit” was significantly associated with lower satisfaction with social behaviors (QFS, social functioning questionnaire) and quality of life (WHOQOL-BREF). Distress due to “inattention/disorganization” and “self-esteem deficit” significantly decreased after a 1-year therapy. The SDAAA-SR represents a reliable and valid measure of adult ADHD-associated distress, an important but often undocumented parameter in the clinical setting. Its use as an outcome variable in psychological interventions deserves further investigation.

**Keywords** ADHD · Adult · Instrument validation · Psychological distress

## Introduction

The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association 2013) updated the diagnosis of Attention-Deficit/Hyperactivity Disorder (ADHD), to finally state that this neurodevelopmental disorder affecting 3–5% of children (Barkley and Murphy 1998) generally persists throughout adulthood. Indeed longitudinal studies have shown that approximately 60–65% of children with ADHD still present symptoms as adults (Faraone et al. 2006; Barkley 2002; Weiss et al. 1985; Mannuzza et al. 1993). However, epidemiological studies in adults show that the prevalence of adult ADHD in the adult general population can reach 5% (Fayyad et al. 2007; Kessler et al. 2006). Recent longitudinal cohort studies suggest an adult-onset form of ADHD (Moffitt et al. 2015; Caye et al. 2016), which could explain this prevalence in adults.

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Three presentations of ADHD are described in the DSM-5: predominantly inattentive, predominantly hyperactive-impulsive and combined (American Psychiatric Association 2013). Besides usual symptoms, adults suffering from ADHD face many difficulties in personal, familial, social and professional functioning. They are unstable in their professional life, encounter more professional difficulties, are perceived as under-performing and reach a lower than expected occupational status as adults (Barkley 2002; Barkley et al. 2006; Biederman et al. 2012). They have trouble getting organized in their daily lives and have more financial problems (Barkley 2008, 2014). They also have more difficulties to maintain relationships and face more social problems; they become for instance parents at a younger age and are less satisfied with their marital life (Barkley et al. 2006; Barkley 2008). They are more likely to engage in antisocial or risky behaviors and to encounter legal problems like traffic infractions or accidents (Barkley et al. 1993, 1996). Addictions and antisocial behaviors such as shoplifting or selling drugs are also frequent in ADHD adults (Schubiner et al. 2000; Barkley et al. 2004, 2006). ADHD must be considered as a chronic condition that comes rarely alone. Indeed, the great majority of ADHD patients suffer from one or more additional disorders including mood-disorders, substance abuse, restless legs syndrome, bulimia, personality disorders or obsessive-compulsive disorders (Pliszka 1998; Bernardi et al. 2012; Biederman et al. 2006a, b).

In establishing ADHD diagnosis in adults, structured diagnostic interviews help in investigating DSM-5 criteria in childhood and adulthood. The Conners' adult ADHD diagnostic interview for the DSM-IV (CAADID; Epstein et al. 2000) and the Dutch diagnostic interview for ADHD in adults (DIVA 2.0; Kooij 2012) were developed specifically for this purpose. The Brown Attention-Deficit Disorder Scale (BADD; Brown 1996) can also be mentioned. It is a 40-item scale covering a wide range of symptoms, which can be administered as an interview. Several self-report scales are also available, like the Adult Self-Report Scale (ASRS-V1.1, Adler et al. 2003), which can be used as a screener (first 6 items) or to rate the severity of ADHD symptoms in adults (18 items), and the Conners' Adult ADHD Rating Scale (CAARS; Conners et al. 1999), a 66-item scale covering symptoms of inattention, hyperactivity and impulsivity, and associated symptoms like emotional lability. The Wender Utah Rating Scale (WURS; Ward et al. 1993) can also be used. It allows a retrospective assessment of symptoms and signs of ADHD in childhood. A systematic review of 14 currently available adult

ADHD rating scales that assess the frequency of current symptoms or behaviors on continuous dimensions can be found in Taylor et al. (2011).

Because global quality of life (QoL) in patients with ADHD is poorer than in healthy subjects (Chao et al. 2008) and negatively correlated with the severity of ADHD symptoms (Adler et al. 2009; Gjervan et al. 2012), a few ADHD-specific QoL questionnaires have also been developed. These include the ADHD Impact Module for Adults (AIM-A; Landgraf 2007), which measures concepts, such as living with ADHD, general well-being, performance and daily functioning, relationships/communication, bothersomeness/concern and daily interference. Another is the adult ADHD Quality of Life Scale (AAQoL; Brod et al. 2006, 2015), which assesses the impact of ADHD on everyday activities and quantifies its consequences in four domains: life productivity, psychological health, life outlook and relationships.

Although instruments are available to screen for ADHD diagnosis, assess the frequency of symptoms and evaluate QoL consequences, little attention has been provided to the subjective distress of adult patients living with ADHD. Subjective distress is highly and consistently associated with treatment seeking across different psychiatric disorders (Angst et al. 2010). Furthermore, enhancing reality acceptance through mindfulness and developing distress tolerance skills are hypothesized (Lynch et al. 2006) to be potential mechanisms of change in psychotherapeutic approaches, such as dialectical behavior therapy (DBT; Linehan 1993). The global objective of the present study was thus to focus on the subjective feeling of distress or psychological discomfort rather than on the frequency or intensity of symptoms, even though distress level and symptom severity might be linked. In clinical practice, quantifying subjective distress might help therapists to identify behaviors that are sources of suffering in everyday life and that could be targeted in psychotherapy. An instrument evaluating subjective distress might be a relevant outcome parameter in psychological interventions and a valuable follow-up tool in the chronic course of adult ADHD.

The current study presents the development of the Subjective Distress Associated with Adult ADHD-Self-Report (SDAAA-SR), a new instrument for the assessment of psychological distress in ADHD adults. It provides data on its psychometric properties, including factor structure, internal consistency, test-retest reliability, convergent validity, discriminant validity and sensitivity to change after a 1-year DBT-inspired therapy for ADHD adults (Perroud et al. 2015).

## Methods

### Participants

#### *Sample 1*

A sample of 247 university students (72% females, median age 18, 80% range 18–20) were recruited at the University of Namur, Belgium, and invited to fill the SDAAA-SR and other questionnaires. Most students were single ( $N = 203$ , 82%), had no child ( $N = 239$ , 97%) and had an upper secondary education ( $N = 226$ , 92%). In order to assess test-retest reliability of the SDAAA-SR, 98 students were reassessed two months later. Participants were informed that the aim of the project was to validate a questionnaire. They did not receive remuneration or other benefits. The study protocol was approved by the local Hospital Ethics Committee.

#### *Sample 2*

One hundred and forty-two adult ADHD outpatients (44% females, median age 32, 80% range 20–48) were recruited in a specialized center for the diagnosis and care of adult ADHD patients at the University Hospitals of Geneva, Switzerland. Patients were predominantly single ( $N = 99$ , 70%) and without children ( $N = 101$ , 71%). About half had a secondary education ( $N = 78$ , 55%), and most of them ( $N = 100$ , 70%) were studying or working at the time of the study. They filled the SDAAA-SR during the ADHD diagnostic procedure which included a comprehensive clinical history examination by a trained psychiatrist and the Diagnostic Interview for ADHD in Adults (DIVA 2.0; Kooij 2012). In addition, all patients fill the Wender Utah Rating Scale (WURS; Ward et al. 1993; Romo et al. 2010), a 25-item self-report questionnaire assessing the severity of childhood ADHD. Following Fossati et al. (Fossati et al. 2002), we used a very stringent cutoff score of 46 to indicate the existence of ADHD in childhood. Forty-four patients (31%) were diagnosed as predominantly inattentive, while 98 subjects (68.3%) showed a combined symptom profile. Only one patient (0.7%) was diagnosed with hyperactive/impulsive subtype. Most patients were addressed to our center for a suspected ADHD and thus had no ADHD medication at the time of the diagnosis ( $N = 137$ ; 96%). However, 40 patients (28%) received other pharmacological treatments, such as benzodiazepines, antidepressants antipsychotics or mood stabilizers.

In order to test the SDAAA-SR sensitivity to change, 25 ADHD patients were reassessed at the end of a 1-year therapy inspired from DBT (Perroud et al. 2015). The study

protocol was approved by the Ethics Committee of the Geneva University Hospital. Informed written consent was obtained from all patients.

### Development of the SDAAA-SR questionnaire

The selection of the initial pool of 62 items was based on ADHD symptoms in the DSM-5 and subjective complaints and impairments often reported by adult ADHD patients in clinical settings. The selected items were discussed and revised by two experienced clinicians (one psychiatrist and one psychologist) to verify their clarity and content validity. Each item referred to specific behaviors, e.g., “I do everything at the last minute” or “I interrupt conversations.” Respondents were asked to evaluate the level of distress associated with these different behaviors according to a 5-point Likert scale (0 = no distress, 1 = low distress, 2 = mild distress, 3 = moderate distress, 4 = severe distress).

Because we aimed at obtaining a concise instrument to be used in longitudinal studies where attrition is a particular concern, the initial 62-item questionnaire was submitted to an item selection and deletion procedure. Provided that the target construct was expected to be multidimensional, an approach based on inter-item correlations and principal component analysis (PCA, see below) was used. In keeping with recommendations (Clark and Watson 1995), we proceeded in 3 steps: (1) items were discarded if their distribution was very unbalanced (e.g., >95% of subjects providing the same score), because they would correlate weakly with other items; (2) items were kept if they loaded strongly on one dimension and relatively weakly on the others, in order to focus on sets of items unambiguously relevant to each dimension; (3) internal consistency, considered as a necessary condition, was checked for each subscale of the reduced instrument (Cronbach's alpha  $\geq 0.80$ ). This procedure led to a reduced 33-item questionnaire (see below). The original French version is available from the authors.

### Additional measures

All participants completed the ASRS-V1.1 (Adler et al. 2003), which can be used as a screener for ADHD in adults (based on 6 items, positive screening if 4 or more responses in the dark-shaded boxes) or as a frequency measure of hyperactive-impulsive (9 items) and inattentive (9 items) symptoms over the past 6 months.

The Beck Depression Inventory II (BDI-II; Beck et al. 1996) assesses the current severity of depression symptoms. It includes 21 items rated on a 4-point scale (0–3). The total score ranges from 0 to 63, with higher score indicating the greater severity.

The Beck Hopelessness Scale (BHS; Beck et al. 1974) estimates the degree of pessimism and negative expectancies about the future. Composed of 20 true–false statements, it allows estimating a total score that ranges from 0 to 20, with the higher score indicating more subjective hopelessness.

The Barratt Impulsiveness Scale (BIS-11; Patton et al. 1995) is a 30-item questionnaire designed to assess the personality/behavioral construct of impulsiveness. Six first-order factors (attention, motor, self-control, cognitive complexity, perseverance and cognitive instability impulsiveness) and three second-order factors (attentional, motor and non-planning impulsiveness) are computed. Higher scores indicate a higher level of impulsiveness.

The WHOQOL-BREF is the short version of the World Health Organization Quality of Life instrument (Baumann et al. 2010). It includes 26 questions investigating four domains: physical health, psychological, social relationships and environment. The four domain scores are converted to 0–100 scales.

The “Questionnaire de Fonctionnement Social” (QFS: Social Functioning Questionnaire) is a 16-item self-report questionnaire assessing the frequency of and the satisfaction with social behaviors (Zanello et al. 2006).

## Data analysis

The internal structure of the initial 62-item questionnaire was explored using PCA with oblique rotation (promax method), because the underlying components were expected to correlate with each other. The suitability of the correlation matrix was examined with Bartlett's test of sphericity and Kaiser–Meyer–Olkin index. The number of retained components was determined by considering the following criteria: (1) the Kaiser's criterion (i.e., retaining components with eigenvalues  $\geq 1$ ); (2) the scree plot method (i.e., retaining components in the steep part of the graph); and (3) percent explained variance. Different candidate factorial structures were compared with respect to the following interpretability criteria: (1) The rotated pattern matrix demonstrated a simple structure, i.e., at least 5 items had strong loadings ( $\geq 0.5$ ) on each component and low cross-loadings on the others ( $\leq 0.3$ ) (Costello and Osborne 2005); (2) variables loading on the same component had a similar meaning; (3) variables loading on different components measured different constructs. The PCA was repeated for the reduced 33-item questionnaire, in order to check for the robustness of its underlying structure.

The internal consistency of the summated subscales was assessed with average inter-item correlation coefficients (expected range 0.40–0.50 for narrow constructs (Clark and Watson 1995), corrected item-total correlation coefficients (expected to be  $\geq 0.30$ ) and Cronbach's alpha coefficient

(generally considered as good if  $\geq 0.80$  (Clark and Watson 1995)). Test-retest reliability was assessed in a subgroup of students assessed on two occasions using the intra-class correlation coefficient (ICC), considering agreement in a two-way random effects ANOVA model (0.70 recommended as a minimum standard (Terwee et al. 2007). Discriminant validity was examined by testing for differences between groups, using the Mann–Whitney U test. Convergent validity was evaluated through associations between the summated subscales and other instruments, using Spearman rank correlation coefficients (considered as moderate if  $\geq 0.30$  and large if  $\geq 0.50$ ). Sensitivity to change was tested in a subgroup of patients assessed before and after a 1-year follow-up, using the Wilcoxon signed ranks test. Effect sizes ( $\eta^2$ , i.e., proportion of the total variability accounted for) were derived from z-approximations of the U and T statistics of the Mann–Whitney U test and Wilcoxon test, respectively (Fritz et al. 2012). All statistical analyses were conducted with SPSS version 22 (IBM Corporation, Armonk, NY, USA). All tests were two-tailed, with significance level at 0.05.

## Results

### Development of the 33-item scale

Sixty-two items in the initial pool were distributed over the full range of possible scores (0–4) in both groups of students ( $n = 247$ ) and patients ( $n = 142$ ). No item was discarded because of an excessively unbalanced distribution. Principal component analysis with oblique rotation was first performed on the 62-item questionnaire in order to identify underlying, meaningful constructs and reduce the item pool to a subset relevant to these constructs. The correlation matrix was suitable for PCA (Bartlett's test of sphericity,  $p < 0.001$ ; Kaiser–Meyer–Olkin index 0.94). Using Kaiser's criterion, a 12-component structure was obtained that explained 61.3% of the variance. The first 6 components accounted for 30.9, 5.2, 4.7, 3.7, 2.9 and 2.7% of the variance, respectively. The scree plot suggested that only 3–6 components should be retained (online resource 1). These different candidate structures were carefully examined and compared with respect to interpretability criteria: only the 3-component solution (40.7% explained variance) met criteria for a simple structure and meaningful constructs. All items that had strong loadings ( $\geq 0.5$ ) on one component and low cross-loadings on the others ( $\leq 0.3$ ) were retained in the 33-item questionnaire (online resource 1).

The PCA was repeated on the reduced set of 33 items (Bartlett's test of sphericity,  $p < 0.001$ ; Kaiser–Meyer–Olkin index 0.93). The scree plot clearly identified 3

components, which explained 46.9% of the total variance (32.1, 8.0 and 6.8% for components 1, 2 and 3 before rotation, respectively). Questionnaire items and loadings on each component are presented in Table 1. Sixteen items loaded on the first component, which was labeled “distress due to inattention/disorganization.” Ten items loaded on

the second component labeled “distress due to hyperactivity/impulsivity.” Seven items contributed to the third component labeled “distress due to self-esteem deficit.” Inter-correlations of the three components ranged from 0.32 to 0.49. Three summated subscales were derived by adding the corresponding items. Correlation coefficients

**Table 1** Component loadings of the 33-item SDAAA-SR (PCA with promax rotation)

Items	Loadings		
	Component 1: distress due to inattention/disorganization	Component 2: distress due to hyperactivity/impulsivity	Component 3: distress due to self-esteem deficit
I do not meet the deadlines	<b>0.81</b>	-0.08	-0.11
I can't sustain my attention on a task	<b>0.80</b>	0.05	-0.08
I don't manage to finish my projects	<b>0.78</b>	-0.08	0.08
I need that someone structures things for me	<b>0.75</b>	-0.12	0.05
I have trouble scheduling my activities	<b>0.73</b>	-0.07	0.04
I do everything at the last minute	<b>0.73</b>	0.17	-0.19
I have poor motivation to do things	<b>0.73</b>	-0.09	0.09
I avoid tasks requiring concentration and mental effort	<b>0.71</b>	0.07	0.01
I botch my activities	<b>0.70</b>	-0.02	0.02
I am slow in task completion	<b>0.64</b>	-0.04	0.01
I forget my appointments or obligations	<b>0.62</b>	-0.02	0.02
I have difficulties managing my time	<b>0.61</b>	0.02	0.10
I have trouble not losing the thread of the conversation	<b>0.58</b>	0.17	0.03
I can't manage to watch a film right to the end or to complete readings	<b>0.57</b>	0.19	-0.12
I have to rely on my partner or my relatives to compensate for my difficulties	<b>0.55</b>	-0.06	0.22
I get distracted from my tasks due to activity or noise around me or due to my own thoughts	<b>0.49</b>	0.23	-0.06
I speak too much, too quickly or too loud	-0.08	<b>0.72</b>	0.03
I am multitasking	0.04	<b>0.66</b>	-0.02
I take risks	-0.10	<b>0.65</b>	0.02
I seek intense sensations	-0.15	<b>0.61</b>	0.01
I interrupt conversations	0.23	<b>0.61</b>	-0.02
I am impatient	0.06	<b>0.60</b>	0.06
I verbally or physically impose my presence	0.12	<b>0.58</b>	-0.14
I don't read instructions or user manuals carefully	0.01	<b>0.58</b>	0.07
I speak without thinking	0.09	<b>0.53</b>	0.08
I am quick-tempered	-0.04	<b>0.50</b>	0.23
I have a negative self-image	0.10	-0.07	<b>0.79</b>
I doubt my skills	0.04	-0.03	<b>0.78</b>
I am afraid that others get bored with me	-0.02	0.10	<b>0.71</b>
I fear of failure when I begin a task	0.11	-0.08	<b>0.67</b>
I am embarrassed in groups because of my difficulties	0.21	-0.09	<b>0.60</b>
I don't dare to start a new relationship	-0.23	0.16	<b>0.59</b>
I can't take criticism	-0.11	0.19	<b>0.58</b>

Items that are loaded highly for each component are given in bold

between summated subscales and corresponding component were all above 0.99.

### Distribution of summated subscale scores and internal consistency

Descriptive statistics for students and patients is provided in Table 2. No floor or ceiling effect was observed in either sample (<3% of observed values at the lowest possible score; <1% at the highest possible score).

Internal consistency was excellent for the “distress due to inattention/disorganization” subscale, with Cronbach’s  $\alpha$  coefficient at 0.93 (average inter-item correlation coefficient 0.44; corrected item-total correlation coefficients  $\geq 0.52$ ). It was good for the subscales “distress due to hyperactivity/impulsivity” (Cronbach’s  $\alpha$  0.83; average inter-item correlation coefficient 0.33; corrected item-total correlation coefficients  $\geq 0.41$ ) and “distress due to self-esteem deficit” (Cronbach’s  $\alpha$  0.82; average inter-item correlation coefficient 0.40; corrected item-total correlation coefficients  $\geq 0.40$ ).

### Test-retest reliability

Test-retest reliability was examined in a subgroup of students ( $n = 98$ ) assessed on two occasions (2 months apart) and hypothesized to be stable with respect to the investigated constructs. Test-retest reliability was substantial for all three subscales, with ICC 0.67, 0.63 and 0.70 for distress due to “inattention/disorganization,” “hyperactivity/impulsivity” and “self-esteem deficit,” respectively. A systematic change was detected for “distress due to self-esteem deficit,” which decreased significantly from the first to the second assessment (ANOVA, time effect  $p = 0.018$ ).

### Discriminant validity

The three summated subscales were first investigated for expected differences between students and patients (Table 2). Both “distress due to inattention/disorganization” and “distress due to hyperactivity/impulsivity” were significantly higher in patients, whereas no difference was observed for “distress due to self-esteem deficit.” Using the ASRS-V1.1 screener (items 1–6), 44 students (18.5%) had symptoms highly consistent with ADHD. As indicated in Table 2, distress due to “inattention/disorganization” and “hyperactivity/impulsivity” was significantly higher among students detected as positive, compared to the ones negative for ADHD. No significant difference was observed for “distress due to self-esteem deficit.”

### Convergent validity

As expected, distress due to SDAAA-SR “inattention/disorganization” and “hyperactivity/impulsivity” displayed moderate to large correlations with the corresponding dimensions of the ASRS-V1.1, in both students and patients (Table 3). SDAAA-SR “distress due to self-esteem deficit” was highly correlated with depression severity in both groups. In patients, “distress due to inattention/disorganization” displayed moderate positive correlations with impulsiveness (attentional and non-planning; BIS-11), depression (BDI-II) and hopelessness (BHS), whereas it was accompanied with decreased satisfaction with social behaviors (QFS) and lower perceived quality of life (physical and psychological; WHOQOL-BREF). “Distress due to hyperactivity/impulsivity” correlated positively with attentional impulsivity (BIS-11) and depression (BDI-II) and was only weakly associated with impaired quality of life (psychological and environment; WHOQOL-BREF). “Distress due to self-esteem deficit”

**Table 2** Discriminant validity of SDAAA-SR summated subscores

<i>n</i>	Component 1: distress due to inattention/disorganization (16 items, possible range 0–64)			Component 2: distress due to hyperactivity/impulsivity (10 items, possible range 0–40)			Component 3: distress due to self-esteem deficit (7 items, possible range 0–28)		
	Median (range)	Effect size ( $\eta^2$ ) <sup>a</sup>	P value <sup>b</sup>	Median (range)	Effect size ( $\eta^2$ ) <sup>a</sup>	P value <sup>b</sup>	Median (range)	Effect size ( $\eta^2$ ) <sup>a</sup>	P value <sup>b</sup>
Students	247	16 (0–54)		13 (0–31)			14 (1–27)		
Patients	142	35 (0–64)	0.25	<0.001	15 (0–40)	0.02	0.002	15 (0–27)	<0.01 0.32
Students: negative for ADHD <sup>c</sup>	194	14 (0–54)		12 (0–30)			14 (1–27)		
Positive for ADHD <sup>c</sup>	44	27 (0–42)	0.09	<0.001	18 (0–31)	0.04	0.001	15 (3–24)	0.01 0.09

<sup>a</sup> Proportion of the total variability taken into account by the difference between groups (see data analysis)

<sup>b</sup> Mann-Whitney *U* test

<sup>c</sup> According to the ASRS-V1.1 screening algorithm (see “Methods” section)

**Table 3** Convergent validity of SDAAA-SR summated subscores

Sample instrument	n	Component 1: distress due to inattention/disorganization		Component 2: distress due to hyperactivity/impulsivity		Component 3: distress due to self-esteem deficit		
		r <sub>s</sub>	P value	r <sub>s</sub>	P value	r <sub>s</sub>	P value	
<b>Students</b>								
ASRS-V1.1								
Inattention	238	0.50	<0.001	0.31	<0.001	0.31	<0.001	
Hyperactivity/impulsivity	238	0.22	0.001	0.48	<0.001	0.22	0.001	
BDI-II	240	0.38	<0.001	0.26	<0.001	0.52	<0.001	
<b>Patients</b>								
ASRS-V1.1								
Inattention	131	0.50	<0.001	0.24	0.006	0.33	<0.001	
Hyperactivity/impulsivity	131	0.19	0.026	0.45	<0.001	0.24	0.006	
BDI-II	127	0.50	<0.001	0.34	<0.001	0.52	<0.001	
BHS	103	0.30	0.002	0.05	0.63	0.45	<0.001	
BIS-11								
Attentional impulsiveness	107	0.33	<0.001	0.30	0.001	0.24	0.012	
Motor impulsiveness	107	0.07	0.45	0.18	0.066	-0.06	0.57	
Non-planning impulsiveness	107	0.41	<0.001	0.15	0.13	0.32	0.001	
QFS								
Frequency	129	-0.22	0.013	-0.11	0.23	-0.30	<0.001	
Satisfaction	129	-0.45	<0.001	-0.19	0.027	-0.46	<0.001	
WHOQOL-BREF								
Physical health	118	-0.46	<0.001	-0.12	0.21	-0.40	<0.001	
Psychological	118	-0.52	<0.001	-0.28	0.002	-0.59	<0.001	
Social relationships	118	-0.28	0.002	-0.17	0.068	-0.38	<0.001	
Environment	118	-0.29	0.001	-0.29	0.001	-0.46	<0.001	

ASRS-V1.1 Adult ADHD-Self-Report Scale, *BDI-II* Beck Depression Inventory, *BHS* Beck Hopelessness Scale, *BIS-11* Barratt Impulsiveness Scale, *QFS* Social Functioning Questionnaire, *WHOQOL-BREF* World Health Organization Quality Of Life, abbreviated version

was positively correlated with non-planning impulsiveness (BIS-11) and hopelessness (BHS). It was associated with decreased frequency and satisfaction with social behaviors (QFS) and lower scores on all 4 quality of life dimensions (WHOQOL-BREF).

### Sensitivity to change

Sensitivity to change was tested in a small subgroup of patients ( $n = 25$ , 12 females, median age 35, range 21–58) who were reassessed after their participation in a 1-year DBT-inspired therapy for ADHD (Perroud et al. 2015). Scores significantly decreased over time for “distress due to inattention/disorganization” (median 37 vs. 28,  $\eta^2 = 0.28$ ,  $p = 0.006$ ) and “distress due to self-esteem deficit” (median 15 vs. 14,  $\eta^2 = 0.15$ ,  $p = 0.050$ ), whereas no significant change was observed for “distress due to hyperactivity/impulsivity” (median 14 vs. 13,  $\eta^2 = 0.05$ ,  $p = 0.30$ ).

### Discussion

The goal of this study was to evaluate the SDAAA-SR, a new scale developed to assess the intensity of psychological distress associated with ADHD symptoms and related difficulties in adult patients living with ADHD.

After the initial principal component analysis, 33 items were retained from the initial pool and distributed in three subscales labeled “distress due to hyperactivity/impulsivity,” “distress due to inattention/disorganization” and “distress due to self-esteem deficit.” Assessment of psychometric properties showed excellent internal consistency for “distress due to inattention/disorganization” and good internal consistency for “distress due to hyperactivity/impulsivity” and “distress due to self-esteem deficit.” Test-retest reliability examined in a sample of students was substantial for all subscales, but nevertheless indicated that some fluctuations over time might be expected.

In testing the SDAAA-SR subscales for differences between students and patients (Table 2), we found that the

“distress due to inattention/disorganization” and “distress due to hyperactivity/impulsivity” subscales discriminated between the two samples, in keeping with expectations. More importantly, these two subscales also allowed distinguishing between students detected as positive and negative for ADHD according to the ASRS-V1.1 screener. This finding suggests that the SDAAA-SR might be able to capture distress associated with subclinical forms of ADHD in non-clinical populations. We unfortunately do not know yet whether the SDAAA-SR would be able to discriminate between ADHD patients and patients suffering from other psychiatric disorders, or between ADHD patients with and without psychiatric comorbidity. Further research is clearly needed in this field, as other scales such as the ASRS-V1.1 are quite poor in discriminating ADHD patients from patients suffering from bipolar disorder, for instance (Perroud et al. 2014).

As expected, the SDAAA-SR “distress due to inattention/disorganization” and “distress due to hyperactivity/impulsivity” subscales were highly correlated with the corresponding dimensions of the ASRS-V1.1, in both students and patients. The ASRS-V1.1 measures the severity of the disorder, rather than the distress associated with symptoms. However, correlations between the two scales are not surprising, as the more severe the symptoms, the more distressing their impact in everyday life. The associations between the SDAAA-SR and depression (BDI-II) and hopelessness (BHS) support the fact that patients are truly suffering from symptoms such as procrastination, lateness or forgetting. Living with ADHD can indeed be very challenging. Patients described how much they are frustrated with their inability to study or work effectively or to regulate emotions and get satisfaction in their social interactions (Barkley 2014). When the underlying ADHD is not diagnosed and treated, the risk of depression increases (Able et al. 2007; Ginsberg et al. 2014). The correlation between the SDAAA-SR and depression suggests that it can be a sensitive scale for assessing psychological suffering during therapy; however, this link should be further examined in patients with or without comorbid psychiatric conditions like depression.

In a subgroup of 25 ADHD patients who participated in a 1-year DBT-inspired therapy for ADHD (Perroud et al. 2015), we observed significant decreases for “distress due to inattention/disorganization” and “distress due to self-esteem deficit.” This psychotherapeutic intervention not only addresses reduction of symptoms but also reduction of associated psychological suffering. According to these results, the SDAAA-SR might be an interesting tool to finely assess evolution of ADHD patients throughout therapy, either for clinical or research purposes.

These encouraging results are obviously preliminary. First, sample size was limited. Second, samples of

university students and patients attending a specialized center for ADHD patients at a university hospital might not be representative of the normal population and the whole population of patients with ADHD, respectively. Third, the exploratory nature of the analyses needs to be emphasized. Fourth, the study did not take into account a series of factors potentially relevant to the level of distress in ADHD patients, such as illness duration, comorbid psychiatric disorders or ongoing pharmacological treatment. As a consequence, replication studies will be needed to confirm the validity and reliability of the SDAAA-SR, whether in non-clinical or clinical populations, for example patients with depression or anxiety disorders.

In conclusion, preliminary analyses support the reliability and validity of the SDAAA-SR, a new, short, easy to complete 33-item self-report questionnaire, which aims at assessing psychological distress in ADHD patients. It appears to be sensitive to psychological treatment and might be useful, in both research and clinical practice. Indeed, there is a recognized need to assess the efficacy of psychotherapy in adult ADHD and to develop valid outcome instruments in this field.

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#### Compliance with ethical standards

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

**Human participants and/or animals** The study was approved by the Hospital Ethics Committees in Namur and Geneva.

**Informed consent** Informed consent was obtained from all participants included in the study.

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