Cross-Cultural Adult ADHD Assessment in 42 Countries Using the Adult ADHD Self-Report Scale Screener

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Karol Lewczuk[1], Przemysław Marcowski[2], Magdalena Wizła[1], Mateusz Gola[2,3], Léna Nagy[4], Mónika Koós[4], Shane W. Kraus[5], Zsolt Demetrovics[4,6], Marc N. Potenza[7,8,9], Rafael Ballester-Arnal[10], Dominik Batthyány[11], Sophie Bergeron[12,13], Joël Billieux[14,15], Peer Briken[16], Julius Burkauskas[17], Georgina Cárdenas-López[18], Joana Carvalho[19], Jesús Castro-Calvo[20], Lijun Chen[21], Giacomo Ciocca[22], Ornella Corazza[23,24], Rita I. Csako[25], David P. Fernandez[26], Hironobu Fujiwara[27,28,29], Elaine F. Fernandez[30], Johannes Fuss[31], Roman Gabrhelík[32,33], Ateret Gewirtz-Meydan[34], Biljana Gjoneska[35], Joshua B. Grubbs[36], Hashim T. Hashim[37], Md. Saiful Islam[38,39], Mustafa Ismail[37], Martha C. Jiménez-Martínez[40,41], Tanja Jurin[42], Ondrej Kalina[43], Verena Klein[44], András Költő[45], Sang-Kyu Lee[46,47], Chung-Ying Lin[48,49], Yi-Ching Lin[50], Christine Lochner[51], Silvia López-Alvarado[52], Kateřina Lukavská[32], Percy Mayta-Tristán[53], Dan J. Miller[54], Oľga Orosová[43], Gábor Orosz[55], Sungkyunkwan University's research team[56*], Fernando P. Ponce[57], Gonzalo R. Quintana[58], Gabriel C. Quintero Garzola[59,60], Jano Ramos-Diaz[61], Kévin Rigaud[55], Ann Rousseau[62], Marco De Tubino Scanavino[63,64,65], Marion K. Schulmeyer[66], Pratap Sharan[67], Mami Shibata[27], Sheikh Shoib[68,69,70], Vera Sigre-Leirós[14], Luke Sniewski[25], Ognen Spasovski[71], Vesta Steibliene[17], Dan J. Stein[72,73], Berk C. Ünsal[4], Marie-Pier Vaillancourt-Morel[13,74], Marie Claire Van Hout[75], and Beáta Bőthe[12,13]

Abstract

Objective: We analyzed adult ADHD symptoms in a cross-cultural context, including investigating the occurrence and potential correlates of adult ADHD and psychometric examination of the Adult ADHD Self-Report Scale (ASRS) Screener. **Method:** Our analysis is based on a large-scale research project involving 42 countries *(International Sex Survey, N*=72,627, 57% *women, Mage*=32.84; *SDage*=12.57). **Results:** The ASRS Screener demonstrated good reliability and validity, along with partial invariance across different languages, countries, and genders. The occurrence of being at risk for adult ADHD was relatively high (21.4% for women, 18.1% for men). The highest scores were obtained in the US, Canada, and other English-speaking Western countries, with significantly lower scores among East Asian and non-English-speaking European countries. Moreover, ADHD symptom severity and occurrence were especially high among gender-diverse individuals. Significant associations between adult ADHD symptoms and age, mental and sexual health, and socioeconomic status were observed. **Conclusions:** Present results show significant cross-cultural variability in adult ADHD occurrence as well as highlight important factors related to adult ADHD. Moreover, the importance of further research on adult ADHD in previously understudied populations (non-Western countries) and minority groups (gender-diverse individuals) is stressed. Lastly, the present analysis is consistent with previous evidence showing low specificity of adult ADHD screening instruments and contributes to the current discussion on accurate adult ADHD screening and diagnosis. *(J. of Att. Dis. 2024; 28(4) 512-530)*

Keywords

attention deficit/hyperactivity disorder, ADHD, adult ADHD, cross-cultural, assessment

[1]Cardinal Stefan Wyszynski University, Warsaw, Poland
[2]University of California, San Diego, USA
[3]Institute of Psychology, Polish Academy of Sciences, Poland
[4]ELTE Eötvös Loránd University, Budapest, Hungary
[5]University of Nevada, Las Vegas, USA
[6]University of Gibraltar, Gibraltar
[7]Yale University School of Medicine, New Haven, CT, USA
[8]Connecticut Council on Problem Gambling, Wethersfield, CT, USA
[9]Connecticut Mental Health Center, New Haven, CT, USA
[10]University Jaume I of Castellón, Spain
[11]Sigmund Freud University Vienna, Austria
[12]Université de Montréal, Canada
[13]Centre de Recherche Interdisciplinaire sur les Problèmes Conjugaux et les Agressions Sexuelles (CRIPCAS), Canada.
[14]University of Lausanne, Switzerland
[15]Lausanne University Hospitals, Switzerland
[16]University Medical Centre Hamburg-Eppendorf, Germany
[17]Neuroscience Institute, Lithuanian University of Health Sciences, Lithuania
[18]National Autonomous University of Mexico, Mexico
[19]Universidade de Aveiro, Portugal
[20]University of Valencia, Spain
[21]Fuzhou University, China
[22]Sapienza University of Rome, Italy
[23]University of Hertfordshire, UK
[24]University of Trento, Italy
[25]Auckland University of Technology, New Zealand
[26]Nottingham Trent University, UK
[27]Kyoto University, Kyoto, Japan
[28]RIKEN Center for Advanced Intelligence Project, Tokyo, Japan
[29]The General Research Division, Osaka University Research Center on Ethical, Legal and Social Issues, Osaka, Japan
[30]HELP University, Kuala Lumpur, Malaysia
[31]University of Duisburg-Essen, Germany
[32]Charles University, Prague, Czech Republic
[33]General University Hospital in Prague, Czech Republic
[34]University of Haifa, Israel
[35]Macedonian Academy of Sciences and Arts, Republic of North Macedonia
[36]University of New Mexico, Albuquerque, USA
[37]University of Baghdad, Iraq
[38]Jahangirnagar University, Savar, Dhaka, Bangladesh
[39]Centre for Advanced Research Excellence in Public Health, Savar, Dhaka, Bangladesh
[40]Universidad Pedagógica y Tecnológica de Colombia, Colombia
[41]Grupo de Investigación Biomédica y de Patología, Colombia
[42]University of Zagreb, Croatia
[43]Pavol Jozef Safarik University in Kosice, Slovakia
[44]University of Southampton, UK
[45]University of Galway, Ireland
[46]Hallym University Chuncheon Sacred Heart Hospital, South Korea
[47]Chuncheon Addiction Management Center, South Korea
[48]National Cheng Kung University, Tainan
[49]University of Religions and Denominations, Qom, Iran
[50]National Taipei University of Education, Taipei
[51]Stellenbosch University, South Africa
[52]University of Cuenca, Azuay, Ecuador
[53]Universidad Científica del Sur, Lima, Perú
[54]James Cook University, Australia
[55]Artois University, Arras, France
[56]Sungkyunkwan University, South Korea
[57]Universidad de Talca, Chile
[58]Universidad de Tarapacá, Arica, Chile
[59]Florida State University, Republic of Panama
[60]Sistema Nacional de Investigación, SENACYT, Panama
[61]Universidad Privada del Norte, Lima, Perú
[62]KU Leuven, Belgium
[63]Western University, St. Joseph's Health Care London and London Health Sciences Centre, London, Canada
[64]Lawson Health Research Institute, London, Canada.
[65]Universidade de São Paulo, Brazil
[66]Universidad Privada de Santa Cruz de la Sierra, Bolivia

Introduction

Attention deficit/hyperactivity disorder (ADHD) is one of the most common childhood psychiatric disorders (e.g., Polanczyk & Jensen, 2008), where symptoms have traditionally been considered to diminish or cease in late adolescence or early adulthood (Hill & Schoener, 1996). Although it is now known that impairing levels of symptoms often persist into adulthood (Caye et al., 2016; Kooij et al., 2010), screening, diagnosis, and treatment of ADHD in adults lag behind those in children and require further exploration.

Two central features of ADHD include inattentiveness and impulsiveness/hyperactivity which are inconsistent with the child's developmental level (American Psychiatric Association [APA], 2013). The abovementioned factors have been found to be consistent across cultures for children (e.g., Bauermeister et al., 2010), suggesting common genetic and neurobiological underpinnings of the disorder, which are at least to some degree, not dependent on cultural factors (Meyer, 2005). At the same time, the basic character of adult ADHD across cultures did not undergo similar scrutiny, and previous analysis suggests significant cultural variability in its prevalence, rate of diagnosis, and treatment (Fayyad et al., 2017; Gómez-Benito et al., 2019; Timimi & Taylor, 2004). The present study focuses on the subject of adult ADHD screening in a cross-cultural context, employing and psychometrically evaluating one of the most established measures for adult ADHD assessment, the Adult ADHD Self-Report Scale (ASRS) Screener (Kessler et al., 2005, 2007).

The ASRS Screener and Adult ADHD Assessment

The extended version of the ASRS Screener and its direct predecessor, the ASRS, were developed by the World Health Organization (WHO) World Mental Health Initiative as previously existing measures of adult ADHD failed to address all 18 Diagnostic and Statistical Manual of Mental Disorders (DSM) IV symptoms (Kessler et al., 2005, 2007). Further analysis showed that the same, or even higher, diagnostic precision of the full 18-item ASRS can be achieved with 6 items, creating a unidimensional, shortened version of the full scale (i.e., the ASRS Screener). This version of the screener offered the best psychometric properties and was characterized by a sensitivity of 68.7% and specificity of 99.5%, with a total classification accuracy of 97.9% and high internal consistency (Kessler et al., 2005, 2007). Moreover, the ASRS Screener has demonstrated good test-retest reliability (Matza et al., 2011) as well as high sensitivity to identify ADHD in clinical samples (e.g., for people seeking treatment for substance use disorders; Van De Glind et al., 2013). Recently, the ASRS Screener has been updated to better fit DSM-5 diagnostic criteria for adult ADHD (APA, 2013), although its 6-item length remained unchanged (Ustun et al., 2017). In the current cross-cultural analysis, we are using the original DSM-IV version. Initial work on a clinical sample showed that DSM-IV and DSM-5 versions achieve almost identical psychometric characteristics in terms of sensitivity, specificity, and positive and negative predictive value (Bastiaens & Galus, 2018).

It is worth noting that adult ADHD screening—including the ASRS Screener—is limited by several challenges. First, positive adult ADHD diagnosis currently requires symptoms to be present during childhood, that is, knowledge about recent level of symptoms is not sufficient for a diagnosis. Secondly, symptoms of ADHD are non-specific and can appear in the course of a wide variety of conditions, including anxiety, mood, and substance use disorders (e.g., National Collaborating Centre for Mental Health UK [NCCMH UK], 2009). Lastly, self-report measures are also prone to multiple biases and may be manipulated by respondents (Lovett & Harrison, 2021). Therefore, clinicians should not rely on self-report alone for ADHD assessment, as multiple factors may result in high false-positive rates in self-report screening measures.

Available reports show that the rate of clinical diagnosis of ADHD in the US and some other Western countries has undergone a several-fold increase in the 21st century (e.g., McCarthy et al., 2012; Olfson et al., 2013), which is possibly facilitated by the limitations of screening tools to assess ADHD accurately. However, exaggeration of symptoms by individuals to obtain prescription medications (i.e., stimulants to enhance cognitive performance or for recreational purposes) or disability accommodations have been linked to ADHD overdiagnosis (e.g., Lovett & Harrison, 2021). Given these factors, a surge of ADHD diagnoses in the US has been termed as an epidemic problem (Paris et al., 2015). On the other hand, adults with ADHD often describe experiencing

[67]All India Institute of Medical Sciences, New Delhi, India
[68]Department of Health Services, Srinagar, India
[69]Sharda University, Greater Noida, India
[70]Psychosis Research Centre, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran
[71]University of Ss. Cyril and Methodius in Trnava, Slovakia
[72]University of Cape Town, Rondebosch, South Africa
[73]South African Medical Research Council, South Africa
[74]Université du Québec à Trois-Rivières, Canada
[75]Liverpool John Moores University, UK

*The Sungkyunkwan University's research team includes Dr. H. Chang and Mr. K. Park.

Corresponding Author:
Karol Lewczuk, Institute of Psychology, Cardinal Stefan Wyszynski University, Wóycickiego Street 1/3, building 14, 01-938, Warsaw, Poland.
Email: kar.lewczuk@gmail.com

significant concerns in multiple domains that may not be adequately appreciated or identified by clinicians (Ginapp et al., 2022, 2023). This indicates that further work is needed to better understand the disorder and its repercussions.

An important research avenue in adult ADHD research lies outside of the so-called "WEIRD" populations (i.e., Western, Educated, Industrialized, Rich, and Democratic populations) involving groups underrepresented in research (e.g., Fayyad et al., 2017; Gómez-Benito et al., 2019). Much prior research on adult ADHD has been based on student samples (Lovett & Harrison, 2021), which calls for research efforts targeting populations including older individuals.

Adult ADHD Prevalence and Cultural Context

The prevalence estimates of adult ADHD assessed with the ASRS, as well as other screening tools, differ largely across studies depending on the sample's characteristics, grading criteria, and cut-off values (e.g., Song et al., 2021). As direct cross-cultural comparisons have been rare in previous studies, it is challenging to determine whether differences in estimates may derive from methodological, sample-related, cultural, or other types of differences (Polanczyk et al., 2007). One notable multi-country initiative that allowed for direct-cross cultural comparisons of the prevalence of ADHD in adults is the WHO World Mental Health Surveys (Fayyad et al., 2017). The study was based on standardized interviews administered face-to-face in respondents' homes, assessing a range of DSM-IV disorders. The study involved participants from 20 countries and showed that ADHD occurrence was estimated to be the highest in Western high-income countries like France (7.3%), Northern Ireland (6.0%), and the USA (5.2%)—and lower in middle/low-income countries, for instance Iraq and Romania (both 0.6%; Fayyad et al., 2017).

Occurrence estimates based on self-report surveys employing large-scale national samples range from 2.1 to 11.4% (Adler et al., 2019, $N = 22{,}397$, 2.1%, US sample; Kessler et al., 2006, $N = 3{,}199$, 4.4%, US sample; Polanczyk et al., 2010, $N = 3{,}007$, 5.8%, representative Brazilian sample; Vňuková et al., 2021, $N = 1{,}518$, 7.8%, Czech sample; Weissenberger et al., 2018, $N = 1{,}012$, 11.4%, Czech sample). In rare cases, reported adult ADHD occurrence in general population convenience samples has been higher (20.2%; Panagiotidi et al., 2019, $N = 344$; mostly British sample). In clinical psychiatric populations, adult ADHD rates typically exceed 20% (e.g., Syed et al., 2010, $N = 243$). Moreover, early conceptualizations suggested that ADHD was more prevalent in males (APA, 2013). Currently, however, some researchers claim this disproportion results from the underestimation of female cases arising from bias in sampling, differences in symptomatology or presentation or other factors (Simon et al., 2009).

Although cross-cultural comparative research on ADHD is scarce, findings suggest the existence of cultural differences regarding perceptions of ADHD and ADHD-like symptoms (e.g., Fayyad et al., 2017; Song et al., 2021). As degrees of support versus discouragement towards hyperactive or impulsive behavior may differ between cultures, perceptions of what behavior is considered problematic or disordered may also differ (e.g., Gómez-Benito et al., 2019; Timimi & Taylor, 2004). Thus, quantitative research of ADHD occurrence and treatment-seeking individuals may partially reflect cultural expectations and the influence of cultural environment on behavior (Kooij et al., 2010).

Present Study Goals and Adult ADHD Related Factors

The goal of the present study was to investigate cross-cultural variability in adult ADHD symptoms, by analyzing symptom severity, occurrence of scoring at risk for adult ADHD, and cross-cultural measurement invariance, reliability, and validity of the ASRS Screener across analyzed country samples. Attention was given to non-Western countries, in which ADHD diagnosis is not as established, and to minority samples (e.g., gender-diverse individuals). Investigating cross-cultural measurement invariance is essential, as it shows whether the analyzed underlying construct and employed instrument have the same structure, are interpreted in similar ways, and have comparable applicability in different languages, countries, or subgroups like gender-based ones (e.g., Davidov et al., 2014).

Next, several factors potentially relevant to adult ADHD were analyzed, including age, gender, socioeconomic status, and mental, physical, and sexual health. Previous analysis showed that ADHD symptoms may decline with age (e.g., Faraone & Biederman, 2005), be more severe in gender minority individuals (Bretherton et al., 2021; Dawson et al., 2017), people affected by socioeconomic disadvantage (Russell et al., 2014), and be associated with increased odds of various psychiatric disorders (NCCMH UK, 2009).

Method

Procedure

The International Sex Survey (ISS) is a large, cross-sectional, multi-national study, conducted online in 42 countries.[1] The study design was preregistered (https://osf.io/uyfra).

Translation. The original (English) version of test battery was translated into 25 other languages, according to guidelines of a pre-established translation procedure for cross-cultural studies (Beaton et al., 2000). The translation procedure is also described in more detail in the previously published study protocol (Bőthe et al., 2021).

Data Collection. Data for the ISS were collected between October 2021 and May 2022 in all collaborating countries. Participants who responded to the study advertisements completed an anonymous survey on the Qualtrics Research Suite, which took approximately 25 to 45 minutes. Detailed information regarding data collection was described previously (Bőthe et al., 2021).

To ensure transparency of data use, all published manuscripts and conference presentations which employ data gathered as part of the ISS project are available using the following links: publications, https://osf.io/jb6ey; conference presentations, https://osf.io/c695n.

Ethics. The study was conducted in accordance with the Declaration of Helsinki. The study procedures were approved by appropriate ethics review boards for collaborating countries or, in some cases, the appropriate ethics review boards considered the study exempt from additional approval as it had already been approved by the ethics review boards of the principal investigators' institutions (https://osf.io/n3k2c). All participants were informed about the study and provided informed consent.

Participants

On the data preprocessing stage, participants who (a) failed more than one out of three attention questions and/or (b) produced response patterns suggesting inattentiveness (e.g., contradictory answers to several questions, see https://osf.io/uyfra for a detailed description). Next, after excluding all participants with missing values in the variables of interest, data collected from 72,627 participants (M_{age} = 32.84, SD = 12.57) were included in the analyses. Of all participants, 41,360 identified as women (57.0% of the total sample), 28,877 as men (39.8%), and 2,390 (3.3%) as gender-diverse individuals. Detailed sociodemographic distribution is presented in Table 1.

Measures

The complete set of measures collected, including item questions and available responses in all languages, can be found following the link: https://osf.io/jcz96. Outlined below are measures focal to the current analyses.

Adult ADHD symptom severity was assessed using the ASRS Screener (Kessler et al., 2007). This questionnaire is a 6-item screening measure for adult ADHD symptoms and is an abbreviated version of the 18-item ASRS, developed by the World Health Organization (Kessler et al., 2005). It measures the frequency of relevant behaviors (on a scale from 0 [*Never*] to 4 [*Very often*]).

For the ASRS Screener validity analyses, we included additional measures. With three separate questions, we gathered information about participants' self-reported (1) *mental*, (2) *physical*, and (3) *sexual conditions*. Response options were 0 (indicating that a participant is not suffering from mental, physical, or sexual condition) and 1 (indicating that a participant is suffering from mental, physical, or sexual condition). As an indicator of relative *socioeconomic status*, respondents were also asked to rate their life circumstances in comparison to the others. Response options ranged from 1 (*among the worst*) to 7 (*among the best*).

Data Analysis

All analytical procedures were performed in the *R* computational environment (R Core Team, 2019). Preregistered analysis plan can be found using the link https://osf.io/dk78r. R code used for the statistical analysis can be found following the link https://osf.io/w6dvh/?view_only=ce8cc37f36d34240b687b548385a89a0.

Descriptive Analysis. First, descriptive statistics were calculated for all ASRS Screener items. We rejected the hypothesis that the data were missing non-randomly, based on Little's missing completely at random test, $\chi^2(105) = 106.21$, $p = .449$). On this basis, all observations with missing values in any of the ASRS Screener items were removed.

Dimensionality. The dimensionality of the ASRS Screener was assessed using CFA. Evaluation of model fit was based on established goodness-of-fit metrics (Marsh et al., 2005; Schermelleh-Engel et al., 2003): Comparative Fit Index (CFI; ≥.90 adequate; ≥.95 good), Tucker-Lewis Index (TLI; ≥.90 adequate; ≥.95 good), and Root-Mean-Square Error of Approximation with its 90% confidence interval (RMSEA; ≤.10: acceptable, ≤.08: adequate, and ≤.05: good; Kenny et al., 2015; Schermelleh-Engel et al., 2003). The diagonally weighted least square estimator was used for fitting the CFA and measurement invariance models (Finney & DiStefano, 2013).

Measurement Invariance. To minimize measurement bias and maximize inter-group comparisons validity, tests of measurement invariance were performed with language, country, and gender of participants as grouping variables (Millsap, 2011; Vandenberg & Lance, 2000). Six levels of invariance were tested with increasingly constrained parameters: configural (i.e., same structure across groups), metric (i.e., same factor loadings across groups), scalar (i.e., same item intercepts across groups), and residual (i.e., same residual covariance across groups), as well as latent variance-covariance, and means invariance (Milfont & Fischer, 2010; Vandenberg & Lance, 2000).

Significant changes in RMSEA (ΔRMSEA ≤ .015) and CFI (ΔCFI ≤ .01) suggested which level of measurement invariance was achieved (Chen, 2007; G. W. Cheung & Rensvold, 2002). We also reported additional goodness-of-fit

Table 1. Participants' Sociodemographic Characteristics.

Variable	*N* = 72,627	%
Country		
Algeria	19	0.03
Australia	565	0.78
Austria	684	0.94
Bangladesh	254	0.35
Belgium	584	0.80
Bolivia	325	0.45
Brazil	3,222	4.44
Canada	2,278	3.14
Chile	1,083	1.49
China	2,339	3.22
Colombia	1,707	2.35
Croatia	2,096	2.89
Czech Republic	1,518	2.09
Ecuador	235	0.32
France	1,526	2.10
Germany	3,015	4.15
Gibraltar	44	0.06
Hungary	9,887	13.61
India	147	0.20
Iraq	83	0.11
Ireland	1,449	2.00
Israel	1,164	1.60
Italy	2,015	2.77
Japan	493	0.68
Lithuania	1,813	2.50
Malaysia	1,082	1.49
Mexico	1,854	2.55
New Zealand	2,524	3.48
North Macedonia	1,089	1.50
Panama	282	0.39
Peru	2,321	3.20
Poland	8,231	11.33
Portugal	1,997	2.75
Slovakia	967	1.33
South Africa	1,644	2.26
South Korea	1,318	1.81
Spain	2,091	2.88
Switzerland	1,068	1.47
Taiwan	2,604	3.59
Turkey	674	0.93
United Kingdom	1,245	1.71
United States of America	2,104	2.90
Other	987	1.36
Language		
Arabic	120	0.17
Bangla	227	0.31
Croatian	2,211	3.04
Czech	1,472	2.03
Dutch	467	0.64
English	12,258	16.88
French	3,587	4.94
German	3,238	4.46
Hebrew	1,145	1.58
Hindi	12	0.02
Hungarian	9,681	13.33
Italian	2,043	2.81
Japanese	406	0.56
Korean	1,293	1.78
Lithuanian	1,888	2.60
Macedonian	1,134	1.56
Mandarin—Simplified	2,385	3.28
Mandarin—Traditional	2,618	3.60
Polish	8,623	11.87
Portuguese—Brazil	3,289	4.53
Portuguese—Portugal	2,002	2.76
Romanian	64	0.09
Slovak	1,835	2.53
Spanish—Latin America	7,844	10.80
Spanish—Spain	2,079	2.86
Turkish	706	0.97
Sex at birth		
Female	43,150	59.41
Male	29,477	40.59
Gender		
Woman	41,360	56.95
Man	28,877	39.76
Gender diverse individual	2,390	3.29
Sexual orientation		
Heterosexual	50,098	68.98
Gay or lesbian	4,110	5.66
Bi+	9,152	12.60
Homo- and heteroflexible identities	5,942	8.18
Asexual	953	1.31
Questioning or other	2,372	3.27
Highest level of education		
Primary (e.g., elementary school)	437	0.60
Secondary (e.g., high school)	17,166	23.64
Tertiary (e.g., college or university)	55,024	75.76
Currently being in education		
Yes, in primary education (e.g., elementary school)	53	0.07
Yes, in secondary education (e.g., high school)	0	0.00
Yes, in tertiary education (e.g., college or university)	27,441	37.78
No	45,133	62.14
Work status		
Yes, full time	38,651	53.22
Yes, part-time	10,038	13.82
Yes, I do odd jobs	6,057	8.34
No	17,881	24.62

(continued)

Table 1. (continued)

Variable	*N* = 72,627	%
Socioeconomic status		
My life circumstances are among the best	3,514	4.84
My life circumstances are much better than average	13,062	17.99
My life circumstances are better than average	27,975	38.52
My life circumstances are average	23,515	32.38
My life circumstances are worse than average	3,724	5.13
My life circumstances are much worse than average	652	0.90
My life circumstances are among the worst	185	0.25
Residence		
Metropolis (population is over 1 million people)	23,751	32.70
City (population is between 100,000–999,999 people)	26,529	36.53
Town (population is between 1,000–99,999 people)	18,315	25.22
Village (population is below 1,000 people)	4,032	5.55
Relationship status		
Married or common-law partners	22,000	30.29
In a relationship	23,884	32.89
Widow or widower	393	0.54
Divorced	2,272	3.13
Single	24,078	33.15
Having children		
Yes, 1	7,589	10.45
Yes, 2	9,412	12.96
Yes, 3	3,498	4.82
Yes, 4	938	1.29
Yes, 5	264	0.36
Yes, 6–9	116	0.16
Yes, 10 or more	15	0.02
No	50,795	69.94

metrics (TLI) to account for model parsimony in model comparisons (Marsh et al., 2005, 2013). In cases where full invariance was not achieved, partial invariance tests were performed by progressively releasing equality constraints (i.e., factor loading, intercept, and residual covariance parameters for a given item) in the order according to the expected χ^2 difference until assumed cut-off values for the changes in RMSEA and CFI were met (Milfont & Fischer, 2010) or the number of modification indices was exhausted.

For measure invariance tests, based on an a priori Monte Carlo simulation (see details in https://osf.io/dk78r), only groups consisting of a minimum of 460 participants were retained. Accordingly, in the language-based measurement invariance tests, 20 of 26 groups met the minimum group size criterion, 32 out of 42 groups for country-based tests and all three gender groups (i.e., men, women, gender-diverse individuals) meeting the size criterion for gender-based tests.

Reliability, Validity, and Screening Threshold. ASRS Screener reliability was assessed using Cronbach's alpha and McDonald's omega (McDonald, 1970; McNeish, 2018; Nunnally, 1978). Validity was assessed by calculating ASRS Screener general score correlations with theoretically relevant characteristics and testing for differences in total ASRS Screener scores between participants who identified themselves as men, women, or gender-diverse individuals (one-way analysis of variance; η^2 is provided as effect size as well as Cohen's *d* for pairwise comparisons).

Results

Descriptive Statistics and Confirmatory Factor Analysis of the Full Sample

A one-factor measurement model was fit to the data with acceptable goodness-of-fit (RMSEA = 0.093, 95% CI [0.091, 0.095]; CFI = 0.945; TLI = 0.909). Although the obtained RMSEA was slightly higher than the recommended target value of <0.08, given that other indicators achieved acceptable scores, the tested model was unidimensional and based on only 6 items (which should be considered when evaluating RMSEA; Kenny et al., 2015), we proceeded with this model with no additional adjustments. Summary statistics for ASRS total score, items, and standardized factor loadings are presented in Table 2.

Measurement Invariance Across Language, Country, and Gender Groups

First, measurement invariance was assessed across language groups. Descriptive statistics for countries included in measurement invariance tests are given in *Supplemental Materials* in Table S1. Table S1 contains both unadjusted means for the ASRS Screener in respective country-based subsamples, as well as means adjusted for age and gender as those basic characteristics differed between country subsamples and may have relevance for the presentation of ADHD symptoms. Additionally, both empirical (unadjusted) and adjusted means are depicted in Figure 1. Next, mean comparisons for the countries included in measurement invariance tests are depicted in Tables S2 (unadjusted means) and S3 (means adjusted for age and gender). Since changes in RMSEA and CFI values in the measurement invariance tests did not meet the assumed cut-offs, subsets of constraints were relaxed, resulting in acceptable changes in goodness-of-fit metrics up to the level of residual

Table 2. Descriptive Statistics, Standardized Factor Loadings in the Confirmatory Factor Analysis, and Reliability Metrics of the ASRS Screener.

Item	Range	*M*	*SD*	*SE*	*Skew.*	*Kurt.*	λ
ASRS-1	0–4	1.605	1.069	0.004	0.329	−0.526	.662
ASRS-2	0–4	1.441	1.070	0.004	0.492	−0.392	.751
ASRS-3	0–4	1.929	1.172	0.004	0.103	−0.842	.648
ASRS-4	0–4	1.395	1.101	0.004	0.594	−0.322	.562
ASRS-5	0–4	2.105	1.259	0.005	−0.046	−1.047	.424
ASRS-6	0–4	1.505	1.117	0.004	0.393	−0.568	.304
Total score	0–24	9.979	4.425	0.016	0.299	−0.095	—

Note. All factor loadings were statistically significant at $p < .001$.
M = mean; *SD* = standard deviation; *SE* = standard error; *Skew.* = skewness; *Kurt.* = kurtosis; λ = standardized factor loading.

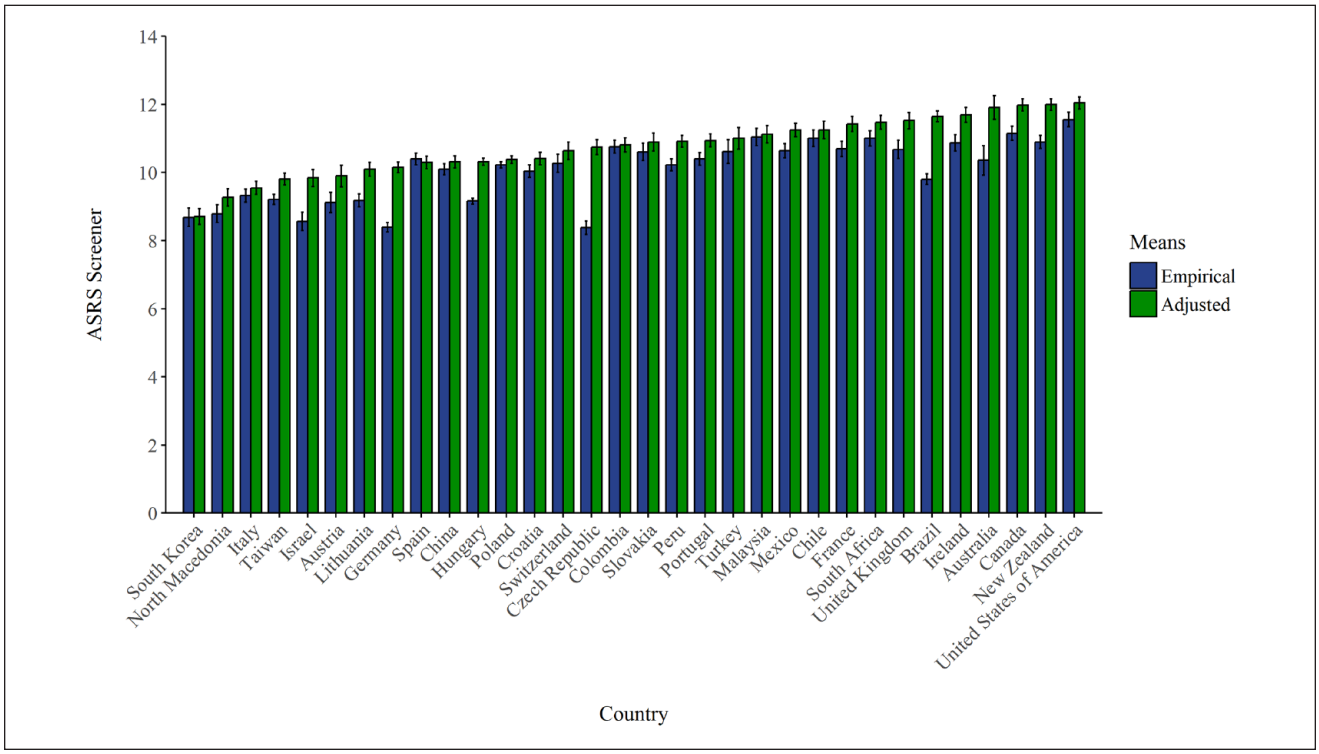

Figure 1. ASRS screener mean scores in respective countries included in measurement invariance tests: empirical (unadjusted) and adjusted for age and gender.

invariance. Second, measurement invariance across country groups was assessed. Like in the language-based tests, partial invariance was tested by relaxing select constraints. Again, this method resulted in adequate changes in goodness-of-fit metrics up to residual invariance. Third, measurement invariance across genders was also tested. The same method was used as described above, resulting in partial invariance, this time up to a variance-covariance level.

These results suggest that, while differences in group means may be present, no significant measurement biases exist across the examined variables. The results of all measurement invariance test sets, along with a detailed description of relaxed constraints, are available in *Supplemental Materials* (Tables S4–S6).

Reliability and Validity

The ASRS demonstrated adequate reliability, as evidenced by acceptable values of the Cronbach's alpha ($\alpha = .73$) and McDonald's omega ($\omega = .82$). There were also differences in ASRS scores with respect to gender, $F(2; 72{,}624) = 855.57$, $p < .001$, $\eta^2 = .02$, with gender-diverse individuals scoring higher ($M = 13.20$, $SD = 4.89$) than women ($M = 10.14$, $SD = 4.36$; $t(72{,}624) = 33.25$, $p < .001$, Cohen's $d = 0.66$),

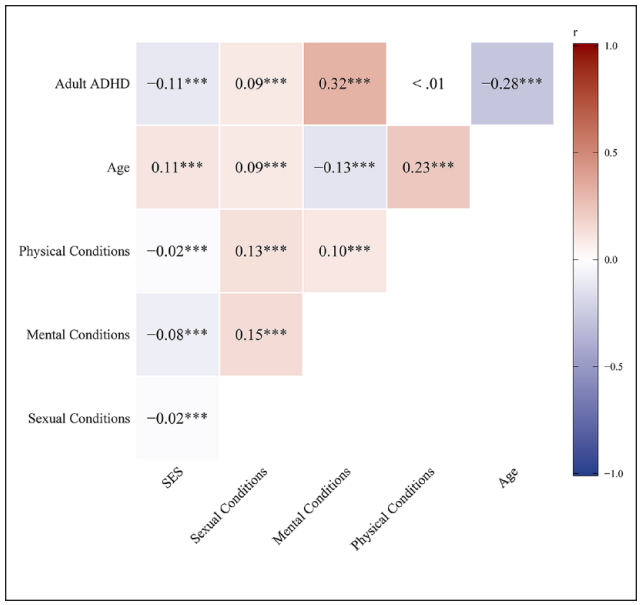

Figure 2. Associations between adult ADHD symptoms and selected factors (Pearson's *r*).
Note. SES = socioeconomic status.
***$p < .001$.

who in turn, scored higher than men ($M = 9.49$, $SD = 4.35$, $t(72{,}624) = 19.35$, $p < .001$, Cohen's $d = 0.15$).

In addition, the ASRS Screener score had weak to moderate associations with theoretically relevant variables (Figure 2), including age ($r = -0.28$, $p < .001$), socioeconomic status ($r = -0.11$, $p < .001$), self-reported experiences with mental illness ($r = 0.32$, $p < .001$), and sexual problems ($r = 0.09$, $p < .001$), but not physical illness ($r = < 0.01$, $p = .218$).

Applicability of the ASRS Cut-Off Score

Applicability of the diagnostic cut-off score for the ASRS Screener was assessed by calculating the proportion of individuals who screened positive using the established threshold of 14 points or more (Kessler et al., 2007). 20.9% of participants (15,201 out of $N = 72{,}627$ participants) scored above the screening threshold, indicating higher risk of adult ADHD. Comparisons of participants who scored lower or higher on the ASRS Screener in their respective countries are presented in Table 3. In terms of gender, 21.4% of women (8,838), 18.1% of men (5,213), and 48.1% of gender-diverse individuals (1,150) scored above the threshold.

Discussion

The aim of the article was the cross-cultural examination of adult ADHD symptoms, filling a gap in research on adult ADHD outside of WEIRD populations and among groups underrepresented in research (e.g., gender-diverse individuals). Concurrently, the present study allowed for achieving these aims while investigating the psychometric properties of one of most popular self-report screening measures, the ASRS Screener. First, the unidimensional model of the

Table 3. Percentages of Participants Who Scored Lower or Higher Than the Pre-Established Cut-off Value for the ASRS Screener.

	Below threshold ($n = 57{,}426$, 79.07%)		At or above threshold ($n = 15{,}201$, 20.93%)	
Country	*n*	%	*N*	%
Algeria	18	94.74	1	5.26
Australia	415	73.45	150	26.55
Austria	587	85.82	97	14.18
Bangladesh	188	74.02	66	25.98
Belgium	477	81.68	107	18.32
Bolivia	217	66.77	108	33.23
Brazil	2,556	79.33	666	20.67
Canada	1,571	68.96	707	31.04
Chile	791	73.04	292	26.96
China	1,910	81.66	429	18.34
Colombia	1,302	76.27	405	23.73
Croatia	1,651	78.77	445	21.23
Czech Republic	1,382	91.04	136	8.96
Ecuador	182	77.45	53	22.55
France	1,137	74.51	389	25.49
Germany	2,713	89.98	302	10.02
Gibraltar	35	79.55	9	20.45
Hungary	8,354	84.49	1,533	15.51
India	117	79.59	30	20.41
Iraq	61	73.49	22	26.51
Ireland	1,032	71.22	417	28.78
Israel	997	85.65	167	14.35
Italy	1,668	82.78	347	17.22
Japan	371	75.25	122	24.75
Lithuania	1,548	85.38	265	14.62
Malaysia	791	73.11	291	26.89
Mexico	1,367	73.73	487	26.27
New Zealand	1,806	71.55	718	28.45
North Macedonia	945	86.78	144	13.22
Panama	221	78.37	61	21.63
Peru	1,827	78.72	494	21.28
Poland	6,407	77.84	1,824	22.16
Portugal	1,569	78.57	428	21.43
Slovakia	744	76.94	223	23.06
South Africa	1,157	70.38	487	29.62
South Korea	1,092	82.85	226	17.15
Spain	1,634	78.14	457	21.86
Switzerland	829	77.62	239	22.38
Taiwan	2,245	86.21	359	13.79
Turkey	507	75.22	167	24.78
United Kingdom	896	71.97	349	28.03
United States of America	1,370	65.11	734	34.89
Other	739	74.87	248	25.13

ASRS Screener was tested and found to fit the data well for the whole sample. This result supports the notion that the ASRS Screener assesses a single underlying construct. The factor loadings of all 6 items were sufficiently high, and the internal consistency achieved for the measure was also high. Overall, this supported the notion that the 6-item ASRS Screener is an internally coherent, unidimensional brief tool for assessing general ADHD symptoms in adults.

The ASRS Screener achieved partial invariance across languages and countries up to the residual invariance level. For gender groups, full metric invariance was achieved, with partial invariance up to the variance-covariance level. This indicates that although some differences in item interpretation and measurement may exist, the basic structure of the adult ADHD symptoms as assessed by the ASRS Screener was similar across the country, language, and gender groups. However, it should be noted that relaxing constraints as part of testing partial invariance on different levels has implications for the interpretability of the results, as well as the generalizability of the questionnaire and inter-group comparisons (Millsap, 2011; Vandenberg & Lance, 2000). Therefore, the present findings should be interpreted cautiously (implications of relaxing equality constraints on each of these levels are further detailed in the *Supplemental Materials*).

Occurrence of Being at Risk for Adult ADHD Across Countries

The occurrence rates estimated in the current study for different countries varied starkly between 9.1 and 32.3%. For most countries in the study (29 of 42), estimates exceeded 20%, higher than those usually reported in previous studies where estimates of current occurrence reached up to 15% (Adler et al., 2019; Kessler et al., 2006, 2007; Vňuková et al., 2021; Weissenberger et al., 2018). Of the countries which qualified for measurement invariance analysis, the highest percentages of being at-risk for adult ADHD were noted for the US (34.9%) and Canada (31.0%), followed predominantly by other Western countries for which English is the primary language: South Africa (29.6%), Ireland (28.8%), New Zealand (28.5%), and the United Kingdom (28.0%). The lowest occurrence was found in a more diverse group of countries including non-English speaking European countries (predominantly not Western European) as well as East Asian countries: Germany (10.0%), North Macedonia (13.2%), Taiwan (13.8%), Israel (14.4%), Lithuania (14.6%), Hungary (15.5%), and South Korea (17.2%). Similarly, gender- and age-adjusted means (which may offer less biased estimates) of adult ADHD symptom severity were highest in the US, New Zealand, Canada, Australia, and Ireland, while lowest in South Korea, North Macedonia, Italy, Taiwan, and Israel.

When interpreting results, it is important to note that the ASRS was designed as a screener. Hence, false positives will exist. Thus, scoring above the diagnostic threshold for ASRS Screener may not reflect a case and should rather call for further clinical assessment. As discussed earlier, symptoms characteristic of ADHD, including inattentiveness, impulsiveness, and hyperactivity, are non-specific to ADHD and may relate to other disorders and behavioral problems (NCCMH UK, 2009). Similar to other measures of adult ADHD, the ASRS Screener does not provide information about the possible childhood onset of the disorder. While this is currently needed for diagnosis, it should be noted that in some cases, ADHD only presents first in adulthood. This might be especially the case with women and others for whom inattentiveness is the leading symptom. Nonetheless, recent findings suggest a high rate of false-positives using self-report screeners for adult ADHD (Chamberlain et al., 2021). Moreover, in the present study, samples were not representative of the national populations, and reported percentages should not be considered an accurate representation of ADHD prevalence or severity as reported across languages, countries, and genders.

Further possible explanations for being at risk for adult ADHD may be related to increased diagnoses of ADHD in the 21st century (and possible overdiagnosis), especially in Western countries. Evidence supporting this hypothesis shows a six-fold increase in cases in which stimulants were prescribed from 1994 to 2009 in the USA alone (Olfson et al., 2013), and doubling in the UK between 2004 and 2009 (McCarthy et al., 2012). Moreover, the previous analysis provided initial evidence that excessive use of digital media among adolescents, which has also increased recently, has been associated with subsequent, significant increases in self-reported ADHD symptoms (Ra et al., 2018).

Increasing rates of adult ADHD diagnosis in Western countries may also be connected to ADHD-related information being accessible and proliferated in Western countries (especially English-speaking countries, where people can easily access much ADHD-related information). Previous findings (Suhr & Wei, 2017) show that exposure to popular information on ADHD can make people focus on their self-perception of impulsive and inattentive behavior seemingly fitting ADHD symptom descriptions, even when they do not meet the formal criteria for the disorder. Next, in the process of formal diagnosis and/or screening, people may inaccurately (although honestly) report heightened levels of symptoms (Suhr & Wei, 2017). Thus, cultural factors related to ADHD may be partially responsible for differences in adult ADHD symptom severity in the countries analyzed in the current study. Lastly, another possible explanative route in light of which current results can be considered is based on previous, initial evidence showing elevated severity of ADHD symptoms as related to the COVID-19 pandemic (Behrmann et al., 2022). As the present research was conducted during the COVID-19 pandemic, findings should be treated with caution.

Sociodemographic Factors and Other Adult ADHD-Related Variables

Analysis of factors potentially associated with adult ADHD in the current work brought significant evidence of convergent analysis of the ASRS Screener (e.g., negative association with age, positive association with self-reported mental health problems).

Age. Our results point to weak to moderate, negative associations of the ASRS Screener score with age, consistent with research showing an age-related decline of ADHD (e.g., Faraone & Biederman, 2005; Polanczyk et al., 2007).

Gender. In our study, women displayed slightly more severe symptoms of ADHD than men. Moreover, more women than men scored above the diagnostic threshold. Some research showed results consistent with this pattern: women with ADHD experienced more intense inattention and hyperactivity symptoms than men with ADHD (Fedele et al., 2012). However, the difference between women and men in our analysis has a small effect size, which supports the hypothesis that sex-related differences in ADHD occurrence and symptom severity are less pronounced for adults than for children (Simon et al., 2009). Importantly, we observed a high occurrence of ADHD-like symptoms among gender-diverse individuals. Previous studies have shown that ADHD was more prevalent among transgender adolescents compared to age-matched individuals (A. S. Cheung et al., 2018). Transgender individuals, compared to individuals identifying as cisgender, more frequently reported having ADHD (Bretherton et al., 2021; Dawson et al., 2017). The reported estimates reached values as high as 23% for transmasculine and 26% for non-binary study participants (Leven et al., 2020). A recent systematic review concluded that evidence suggesting a higher occurrence of ADHD in transgender than cisgender individuals exists; however, the evidence is scarce and thus the authors recommended treating it cautiously (Thrower et al., 2020). This analysis, which is based on a sizable sample of gender-diverse individuals ($n = 2{,}390$) from diverse cultural backgrounds represents an important step in supplementing previously scarce evidence on this subject.

Socioeconomic Status. The evaluation of life circumstances as slightly worse by participants reporting higher ADHD symptom severity is consistent with previous studies showing that ADHD in childhood or adolescence may predict economic disadvantage and academic, occupational, and social dysfunction in adulthood (Du Rietz et al., 2017; Galéra et al., 2012; Kooij et al., 2005).

Mental Illness, Physical Illness, and Sexual Problems. The positive relationship between ADHD symptoms severity and self-reported mental illness that we observed is supported by previous research (NCCMH UK, 2009) showing adult ADHD to increase the odds of having another mental illness, for example, autism spectrum (Jensen & Steinhausen, 2015), mood, and anxiety disorders (Kessler et al., 2006). In our study, ADHD symptoms were not associated with reporting a physical illness, which is in contrast to the meta-analysis that showed co-occurrence of ADHD with asthma, sleep disorders, and obesity, as well as providing evidence for associations with migraine and celiac disease (Instanes et al., 2018). The authors point, however, to the relatively poor quality of studies and the need for large systematic studies investigating this topic, which our work helps to provide. At the same time, our study only included a single general question about experienced physical problems, and no objective measures or medical records were employed. Additionally, our results point to adult ADHD's weak positive relation with self-reported sexual problems. This association aligns with a recent systematic review by Soldati and colleagues (2020) showing that individuals with ADHD report less sexual satisfaction and more sexual dysfunctions, but stronger sexual desire.

In summary, we have provided much needed data on adult ADHD in a multi-national context, including non-Western countries which were previously largely understudied (Fayyad et al., 2017; Gómez-Benito et al., 2019). The study had a very wide scope, as 42 countries, representing six continents and a variety of distinct cultural backgrounds, were included in the analysis. As these data had been lacking in the available literature, the current study can provide a foundation for future research in these countries, while also helping to create scientifically informed screening and diagnostic standards for adult ADHD in multiple populations. On a scientific level, the present results can help establish a more comprehensive and accurate picture of interdependencies between ADHD symptoms and various factors across countries with different cultures, which had also been a knowledge gap, especially in terms of comparing WEIRD and non-WEIRD countries (e.g., Fayyad et al., 2017; Gómez-Benito et al., 2019; Song et al., 2021).

As part of the present project, 26 different language versions of the ASRS Screener were prepared, adapted, and psychometrically examined. These versions are openly available for research and clinical use by other researchers (https://osf.io/jcz96). This allows for further scientific contributions and can facilitate assessment and diagnostic processes in clinical domains. Through providing new scientific results from diverse populations as well as making the assessment tools openly available, the current project can help propel further research on culturally-sensitive interventions for adults with ADHD. Although previous data on this subject were scarce (e.g., Thrower et al., 2020), our findings provide evidence that adult ADHD symptom severity is especially high in gender-diverse individuals.

Significant attention to this group in clinical domains seems warranted (Bretherton et al., 2021; Dawson et al., 2017; Leven et al., 2020).

Limitations and Future Directions

Despite significant strengths, the limitations of the current study should be noted. General limitations associated with using ISS data (e.g., convenience sample use, cross-sectional design, online data collection) are described here https://osf.io/6kscb. Additionally, the analysis is based on self-report, with no additional assessment by a clinician; therefore, the results should be interpreted with caution. The current results should be supplemented in future research involving (1) clinical samples, (2) expert assessment by a clinician, (3) additional ADHD screening measures and a broader palette of measures for convergent and divergent validity investigation (e.g., screening measures for specific co-occurring disorders), (4) representative samples, and (5) longitudinal designs allowing for investigating test-retest reliability. The current analysis should also be replicated with other adult ADHD screening tools (e.g., Ustun et al., 2017).

Conclusions

The present work involved 42 countries and 72,627 participants to investigate cross-cultural differences in adult ADHD. The findings supported inter-cultural stability of a basic adult ADHD symptom structure, as well as the unidimensionality of the ASRS Screener and its high internal consistency and validity. Despite significant cross-national differences, a substantial number of participants in each of the analyzed countries was identified as being at-risk for adult ADHD. This includes some countries previously underrepresented in research (e.g., South Africa, Malaysia), showing the need for developing quality diagnosis, assessment, and treatment for adult ADHD worldwide, particularly in non-Western countries, for which science, assessment, and diagnosis of adult ADHD may be more underdeveloped. At the same time, we caution against the risk of overestimating adult ADHD based solely on self-report screening tools, which should be supplemented by additional information from clinical evaluations for adequate differential diagnosis and assessment of early ADHD onset. Notably, the increased risk among the minority groups like gender-diverse individuals was suggested, which supports a need for further research on adult ADHD in these individuals. As part of the current project, 26 language versions of the ASRS Screener were prepared and psychometrically examined and are freely and openly available as part of the current project documentation. Altogether, the findings of the current project can contribute to significant advancements in adult ADHD assessment standards, including among groups underrepresented in previous research.

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Author Contributions

Conceptualization: K. Lewczuk, L.N., M.K., S.W.K., Z.D., M.N.P., and B.B.
Data curation: K. Lewczuk, P.M., M.W., M.G., L.N., M.K., S.W.K., Z.D., M.N.P., R.B.-A., D.B., S.B., J. Billieux, P.B., J. Burkauskas, G.C.-L., J.C., L.C., G.C., O.C., R.I.C., D.P.F., H.F., E.F.F., J.F., R.G., A.G.-M., B.G., J.B.G., H.T.H., M.S.I., M.I., M.C.J.-M., T.J., O.K., V.K., A.K., S.-K.L., C.-Y.L., Y.-C.L., C.L., S.L.-A., K. Lukavská, P.M.-T., D.J.M., O.O., G.O., S.U.s.r.t., F.P.P., G.R.Q., G.C.Q.G., J.R.-D., K.R., A.R., M.D.T.S., M.K.S., P.S., M.S., S.S., V.S.-L., L.S., O.S., V.S., D.J.S., B.C.Ü., M.-P.V.-M., M.C.V.H., and B.B.
Formal analysis: K. Lewczuk, P.M., and B.B.
Funding acquisition: K. Lewczuk, M.G., L.N., M.K., S.W.K., Z.D., H.F., R.G., and B.B.
Investigation: K. Lewczuk, P.M., M.W., M.G., L.N., M.K., S.W.K., Z.D., M.N.P., R.B.-A., D.B., S.B., J. Billieux, P.B., J. Burkauskas, G.C.-L., J.C., J.C.-C., L.C., G.C., O.C., R.I.C., D.P.F., H.F., E.F.F., J.F., R.G., A.G.-M., B.G., J.B.G., H.T.H., M.S.I., M.I., M.C.J.-M., T.J., O.K., V.K., A.K., S.-K.L., Y.-C.L., C.L., S.L.-A., K. Lukavská, P.M.-T., D.J.M., O.O., G.O., S.U.s.r.t., F.P.P., G.R.Q., G.C.Q.G., J.R.-D., K.R., A.R., M.D.T.S., M.K.S., P.S., M.S., S.S., V.S.-L., L.S., O.S., V.S., D.J.S., B.C.Ü., M.-P.V.-M., M.C.V.H., and B.B.
Methodology: K. Lewczuk, L.N., M.K., S.W.K., Z.D., M.N.P., and B.B.
Project administration: K. Lewczuk, L.N., M.K., S.W.K., Z.D., and B.B.
Resources: K. Lewczuk, L.N., M.K., S.W.K., Z.D., M.N.P., R.G., J.R.-D., and B.B.
Software: K. Lewczuk, P.M., and B.B.
Supervision: B.B.
Validation: K. Lewczuk, P.M., M.W., M.G., L.N., M.K., S.W.K., Z.D., M.N.P., and B.B.
Visualization: K. Lewczuk, P.M., and O.K.

Writing – original draft: K. Lewczuk, P.M., and M.W.
Writing – review & editing: K. Lewczuk, P.M., M.W., M.G., L.N., M.K., S.W.K., Z.D., M.N.P., J. Billieux, J. Burkauskas, J.C., D.P.F., J.F., R.G., A.G.-M., J.B.G., M.S.I., M.C.J.-M., C.-Y.L., Y.-C.L., C.L., K. Lukavská, D.J.M., F.P.P., G.R.Q., G.C.Q.G., M.D.T.S., V.S.-L., L.S., D.J.S., M.-P.V.-M., and B.B.

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ORCID iDs

Karol Lewczuk https://orcid.org/0000-0003-2437-2450
Przemysław Marcowski https://orcid.org/0000-0001-7342-6561
Mateusz Gola https://orcid.org/0000-0002-9691-1102
András Költő https://orcid.org/0000-0002-5509-2809
Chung-Ying Lin https://orcid.org/0000-0002-2129-4242
Ol'ga Orosová https://orcid.org/0000-0003-3758-3273
Marion K. Schulmeyer https://orcid.org/0000-0002-0707-0656

Supplemental Material

Supplemental material for this article is available online.

Note

1. Egypt, Iran, Pakistan, and Romania were included in the study protocol paper as collaborating countries (Bőthe et al., 2021); however, it was not possible to get ethical approval for the study in a timely manner in these countries. Chile was not included in the study protocol paper as a collaborating country (Bőthe et al., 2021) as it joined the study after publishing the study protocol. Therefore, instead of the planned 45 countries (Bőthe et al., 2021), only 42 individual countries are considered in the present study, see details at https://osf.io/n3k2c/.

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Author Biographies

Karol Lewczuk is a scientific researcher affiliated with the Institute of Psychology, Cardinal Stefan Wyszynski University, Warsaw, Poland. Karol Lewczuk is a collaborator on the International Sex Survey.

Przemysław Marcowski is a scientific researcher affiliated with Swartz Center for Computational Neuroscience, University of California, San Diego, San Diego, USA.

Magdalena Wizła is a scientific researcher affiliated with the Institute of Psychology, Cardinal Stefan Wyszynski University, Warsaw, Poland.

Mateusz Gola is a scientific researcher affiliated with (a) the Institute of Psychology, Polish Academy of Sciences, Poland; (b) the Institute for Neural Computations, University of California San Diego, USA. Mateusz Gola is a collaborator on the International Sex Survey. He is also a clinician helping individuals with compulsive sexual behaviors.

Léna Nagy is a scientific researcher affiliated with (a) Doctoral School of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary; (b) Institute of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary. Léna Nagy is a co-investigator on the International Sex Survey.

Mónika Koós is a scientific researcher affiliated with (a) Doctoral School of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary; (b) Institute of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary. Mónika Koós is a co-investigator collaborator on the International Sex Survey.

Shane W. Kraus is a scientific researcher affiliated with the Department of Psychology, University of Nevada, Las Vegas, Las Vegas, NV, USA. Shane W. Kraus is a co-investigator on the International Sex Survey.

Zsolt Demetrovics is a scientific researcher affiliated with (a) Institute of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary; (b) Centre of Excellence in Responsible Gaming, University of Gibraltar, Gibraltar, Gibraltar. Zsolt Demetrovics is a co-investigator on the International Sex Survey.

Marc N. Potenza is a scientific researcher affiliated with (a) Yale University School of Medicine, New Haven, CT, USA; (b) Connecticut Council on Problem Gambling, Wethersfield, CT, USA; (c) Connecticut Mental Health Center, New Haven, CT, USA. Marc N. Potenza is a co-investigator on the International Sex Survey.

Rafael Ballester-Arnal is a scientific researcher affiliated with Departmento de Psicología Básica, Clínica y Psicobiología, University Jaume I of Castellón, Spain. Rafael Ballester-Arnal is a collaborator on the International Sex Survey.

Dominik Batthyány is a scientific researcher affiliated with the Institute for Behavioural Addictions, Sigmund Freud University

Vienna, Austria. Dominik Batthyány is a collaborator on the International Sex Survey.

Sophie Bergeron is a scientific researcher affiliated with (a) Département de Psychologie, Université de Montréal, Montréal, Canada; (b) Centre de Recherche Interdisciplinaire sur les Problèmes Conjugaux et les Agressions Sexuelles (CRIPCAS). Sophie Bergeron is a collaborator on the International Sex Survey.

Joël Billieux is a scientific researcher affiliated with (a) Institute of Psychology, University of Lausanne, Lausanne, Switzerland; (b) Center for Excessive Gambling, Addiction Medicine, Lausanne University Hospitals (CHUV), Lausanne, Switzerland. Joël Billieux is a collaborator on the International Sex Survey.

Peer Briken is a scientific researcher affiliated with the Institute for Sex Research, Sexual Medicine, and Forensic Psychiatry, University Medical Centre Hamburg-Eppendorf, Hamburg, Germany. Peer Briken is a collaborator on the International Sex Survey.

Julius Burkauskas is a scientific researcher leading the Laboratory of Behavioral Medicine, Neuroscience Institute, Lithuanian University of Health Sciences, Lithuania. Julius Burkauskas is a collaborator on the International Sex Survey.

Georgina Cárdenas-López is a scientific researcher affiliated with Virtual Teaching and Cyberpsychology Laboratory, School of Psychology, National Autonomous University of Mexico, Mexico. Georgina Cárdenas-López is a collaborator on the International Sex Survey.

Joana Carvalho is a scientific researcher affiliated with William James Center for Research, Departamento de Educação e Psicologia, Universidade de Aveiro, Aveiro, Portugal. Joana Carvalho is a collaborator on the International Sex Survey.

Jesús Castro-Calvo is an Associate Professor in the Department of Personality, Assessment, and Psychological Treatments, University of Valencia, Spain. Jesús Castro-Calvo is a collaborator on the International Sex Survey.

Lijun Chen is a scientific researcher affiliated with the Department of Psychology, College of Humanity and Social Science, Fuzhou University, China. Lijun Chen is a collaborator on the International Sex Survey.

Giacomo Ciocca is a scientific researcher affiliated with the Section of Sexual Psychopathology, Department of Dynamic and Clinical Psychology, and Health Studies, Sapienza University of Rome, Rome, Italy. Giacomo Ciocca is a collaborator on the International Sex Survey.

Ornella Corazza is a scientific researcher affiliated with (a) Department of Clinical, Pharmaceutical and Biological Sciences, University of Hertfordshire, United Kingdom; (b) Department of Psychocology and Cognitive Science, University of Trento, Italy. Ornella Corazza is a collaborator on the International Sex Survey.

Rita I. Csako is a scientific researcher affiliated with the Department of Psychology and Neuroscience, Auckland University of Technology, Auckland, New Zealand. Rita I. Csako is a collaborator on the International Sex Survey.

David P. Fernandez is a scientific researcher affiliated with Nottingham Trent University, United Kingdom. David P. Fernandez is a collaborator on the International Sex Survey.

Hironobu Fujiwara is a scientific researcher affiliated with (a) Department of Neuropsychiatry, Graduate School of Medicine, Kyoto University, Kyoto, Japan; (b) Decentralized Big Data Team, RIKEN Center for Advanced Intelligence Project, Tokyo, Japan; (c) The General Research Division, Osaka University Research Center on Ethical, Legal and Social Issues, Osaka, Japan. Hironobu Fujiwara is a collaborator on the International Sex Survey.

Elaine F. Fernandez is a scientific researcher affiliated with HELP University, Malaysia. Elaine F. Fernandez is a collaborator on the International Sex Survey.

Johannes Fuss is a scientific researcher affiliated with the Institute of Forensic Psychiatry and Sex Research, Center for Translational Neuro- and Behavioral Sciences, University of Duisburg-Essen, Essen, Germany. Johannes Fuss is a collaborator on the International Sex Survey.

Roman Gabrhelík is a scientific researcher affiliated with (a) Charles University, First Faculty of Medicine, Department of Addictology, Prague, Czech Republic; (b) General University Hospital in Prague, Department of Addictology, Czech Republic. Roman Gabrhelík is a collaborator on the International Sex Survey.

Ateret Gewirtz-Meydan is a scientific researcher affiliated with the School of Social Work, Faculty of Social Welfare and Health Sciences, University of Haifa, Israel. Ateret Gewirtz-Meydan is a collaborator on the International Sex Survey.

Biljana Gjoneska is a tenured scientific researcher affiliated with Macedonian Academy of Sciences and Arts, Republic of North Macedonia. Biljana Gjoneska is a collaborator on the International Sex Survey and serves as national representative in several international research initiatives and EU COST projects on problematic usage of the internet.

Joshua B. Grubbs is an Associate Professor in the Department of Psychology at the University of New Mexico, Albuquerque, United States; and an investigator in the Center for Alcohol, Substance use, And Addiction (CASAA), University of New Mexico, Albuquerque, United States. Joshua B. Grubbs is a collaborator on the International Sex Survey.

Hashim T. Hashim is a scientific researcher affiliated with University of Baghdad, College of Medicine, Iraq. Hashim T. Hashim is a collaborator on the International Sex Survey.

Md. Saiful Islam is a scientific researcher affiliated with (a) Department of Public Health and Informatics, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh; (b) Centre for Advanced Research Excellence in Public Health, Savar, Dhaka-1342, Bangladesh. Md. Saiful Islam is a collaborator on the International Sex Survey.

Mustafa Ismail is a scientific researcher affiliated with University of Baghdad, College of Medicine, Iraq. Mustafa Ismail is a collaborator on the International Sex Survey.

Martha C. Jiménez-Martínez is a scientific researcher affiliated with (a) Universidad Pedagógca y Tecnológica de Colombia, Colombia; (b) Grupo de Investigación Biomédica y de Patología, Colombia. Martha C. Jiménez-Martínez is a collaborator on the International Sex Survey.

Tanja Jurin is a scientific researcher affiliated with the Department of Psychology, Humanities and Social Sciences, University of Zagreb, Croatia. Tanja Jurin is a collaborator on the International Sex Survey.

Ondrej Kalina is a scientific researcher affiliated with the Department of Educational Psychology and Psychology of Health, Pavol Jozef Safarik University in Kosice, Slovakia. Ondrej Kalina is a collaborator on the International Sex Survey.

Verena Klein is a scientific researcher affiliated with the School of Psychology, University of Southampton, United Kingdom. Verena Klein is a collaborator on the International Sex Survey.

András Költő is a senior postdoctoral researcher at the Health Promotion Research Centre, School of Health Sciences, University of Galway, Ireland. András Költő is a collaborator on the International Sex Survey.

Sang-Kyu Lee is a scientific researcher affiliated with (a) Department of Psychiatry, Hallym University Chuncheon Sacred Heart Hospital, South Korea; (b) Chuncheon Addiction Management Center, South Korea. Sang-Kyu Lee is a collaborator on the International Sex Survey.

Chung-Ying Lin is an associate professor affiliated with (a) Institute of Allied Health Sciences, College of Medicine, National Cheng Kung University, Tainan, Taiwan; (b) University of Religions and Denominations, Qom, Iran. Chung-Ying Lin is a collaborator on the International Sex Survey.

Yi-Ching Lin is an associate professor affiliated with the Department of Early Childhood and Family Education, National Taipei University of Education, Taipei, Taiwan. Yi-Ching Lin is a collaborator on the International Sex Survey.

Christine Lochner is a scientific researcher affiliated with SAMRC Unit on Risk & Resilience in Mental Disorders, Stellenbosch University, South Africa. Christine Lochner is a collaborator on the International Sex Survey.

Silvia López-Alvarado is a scientific researcher and the head of the Welfare Department of the University of Cuenca, Ecuador. Silvia López-Alvarado is also a PhD candidate of the KU Leuven (Belgium) and is a collaborator on the International Sex Survey.

Kateřina Lukavská is a scientific researcher affiliated with (a) Charles University, First Faculty of Medicine, Department of Addictology, Prague, Czech Republic; (b) Charles University, Faculty of Education, Department of Psychology, Prague, Czech Republic. Kateřina Lukavská is a collaborator on the International Sex Survey.

Percy Mayta-Tristán is a scientific researcher affiliated with Facultad de Medicina, Universidad Científica del Sur, Lima, Perú. Percy Mayta-Tristán is a collaborator on the International Sex Survey.

Dan J. Miller is a scientific researcher affiliated with the College of Healthcare Sciences, James Cook University, Australia. Dan J. Miller is a collaborator on the International Sex Survey.

Oľga Orosová is a scientific researcher affiliated with Pavol Jozef Safarik University in Kosice, Department of Educational Psychology and Psychology of Health, Slovakia. Oľga Orosová is a collaborator on the International Sex Survey.

Gábor Orosz is a scientific researcher affiliated with Artois University, France. Gábor Orosz is a collaborator on the International Sex Survey.

Sungkyunkwan University's research team includes Dr. H. Chang and Mr. K. Park. Dr. H. Chang and Mr. K. Park are scientific researchers affiliated with the Department of Psychology, Sungkyunkwan University, South Korea. Mr. K. Park is a collaborator on the International Sex Survey.

Fernando P. Ponce is an Associate Researcher affiliated with Facultad de Psicología, Universidad de Talca, Chile, and the Millenium Nucleus on Intergenerational Mobility: From Modeling to Policy (MOVI), Santiago, Chile. Fernando P. Ponce is a collaborator on the International Sex Survey.

Gonzalo R. Quintana, Ph.D. in neuroscience, is an Assistant Professor at the Departamento de Psicología y Filosofía, Facultad de Ciencias Sociales, Universidad de Tarapacá, Arica, Arica y Parinacota, Chile. Dr. Quintana is a collaborator on the International Sex Survey.

Gabriel C. Quintero Garzola is a scientific researcher affiliated with (a) Florida State University, Republic of Panama; (b) Sistema Nacional de Investigación (SNI), SENACYT, Panama. Gabriel C. Quintero Garzola is a collaborator on the International Sex Survey.

Jano Ramos-Diaz is a scientific researcher affiliated with Facultad de Ciencias de la Salud, Universidad Privada del Norte, Lima, Perú. Jano Ramos-Diaz is a collaborator on the International Sex Survey.

Kévin Rigaud is a scientific researcher affiliated with Artois University, France. Kévin Rigaud is a collaborator on the International Sex Survey.

Ann Rousseau is a scientific researcher affiliated with Leuven School for Mass Communication, KU Leuven, Leuven, Belgium. Ann Rousseau is a collaborator on the International Sex Survey.

Marco De Tubino Scanavino is a scientific researcher affiliated with (a) Western University, St. Joseph's Health Care London and London Health Sciences Centre, London, Canada; (b) Lawson Health Research Institute, London, Canada; (c) Universidade de São Paulo, Brazil. Marco De Tubino Scanavino is a collaborator on the International Sex Survey.

Marion K. Schulmeyer is a scientific researcher affiliated with Universidad Privada de Santa Cruz de la Sierra, Bolivia. Marion K. Schulmeyer is a collaborator on the International Sex Survey.

Pratap Sharan is a scientific researcher affiliated with Department of Psychiatry, All India Institute of Medical Sciences, New Delhi -110029, India. Pratap Sharan is a collaborator on the International Sex Survey.

Mami Shibata is a scientific researcher affiliated with Department of Neuropsychiatry, Graduate School of Medicine, Kyoto University, Kyoto, Japan. Mami Shibata is a collaborator on the International Sex Survey.

Sheikh Shoib is a scientific researcher and clinical Neuropsychiatrist affiliated with (a) Department of Health Services, Srinagar, 190001 India; (b) Sharda University, Greater Noida, India (SSh); (c) Psychosis Research Centre, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran. Sheikh Shoib is a collaborator on the International Sex Survey.

Vera Sigre-Leirós is a scientific researcher affiliated with the Institute of Psychology, University of Lausanne, Lausanne, Switzerland. Vera Sigre-Leirós is a collaborator on the International Sex Survey.

Luke Sniewski is a scientific researcher affiliated with Auckland University of Technology, New Zealand. Luke Sniewski is a collaborator on the International Sex Survey.

Ognen Spasovski is a scientific researcher affiliated with Faculty of Philosophy, University of Ss. Cyril and Methodius in Trnava, Slovakia. Ognen Spasovski is a collaborator on the International Sex Survey.

Vesta Steibliene is a scientific researcher affiliated with Laboratory of Behavioral Medicine, Neuroscience Institute, Lithuanian University of Health sciences, Lithuania. Vesta Steibliene is a collaborator on the International Sex Survey.

Dan J. Stein is a scientific researcher affiliated with SAMRC Unit on Risk & Resilience in Mental Disorders, Dept of Psychiatry & Neuroscience Institute, University of Cape Town. Dan J. Stein is a collaborator on the International Sex Survey.

Berk C. Ünsal is a scientific researcher affiliated with (a) Doctoral School of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary; (b) Institute of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary. Berk C. Ünsal is a collaborator on the International Sex Survey.

Marie-Pier Vaillancourt-Morel is an Associate Professor in the Department of Psychology at the Université du Québec à Trois-Rivières, Trois-Rivières, Canada.. Marie-Pier Vaillancourt-Morel is a collaborator on the International Sex Survey.

Marie Claire Van Hout is a Professor of International Public Health Practice and Policy at the Faculty of Health, Liverpool John Moores University, United Kingdom. Marie Claire Van Hout is a collaborator on the International Sex Survey.

Beáta Bőthe is a scientific researcher affiliated with (a) the Département de Psychologie, Université de Montréal, Montréal, Canada; (b) Centre de Recherche Interdisciplinaire sur les Problèmes Conjugaux et les Agressions Sexuelles (CRIPCAS). Beáta Bőthe is the principal investigator of the International Sex Survey.