International Journal of PSYCHOLOGICAL RESEARCH

RESEARCH ARTICLE

Vol 13, N° 2
https://revistas.usb.edu.co/index.php/IJPR
ISSN 2011-2084
E-ISSN 2011-7922

Psychometric Properties of a Brief Screening Measure for ADHD in Adults

Propiedades psicométricas de una escala breve para la detección del TDAH en adultos

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Editor-in-Chief:
Mauricio Cuartas–Arias. MSc. PhD.

Manuscript received: 31-12-2019
Revised: 26-05-2020
Accepted: 13-06-2020

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Declaration of data availability: All relevant data are within the article, as well as the information support files.

Conflict of interests: The authors have declared that there is no conflict of interest.

How to Cite:
Bakare, B. & Jordanova, V. (2020). Psychometric Properties of a Brief Screening Measure for ADHD in Adults. *International Journal of Psychological Research*, *13*(2), 78–88. https://doi.org/10.21500/20112084.4511

Abstract.
The use of screening tools is an effective and practical approach within the clinical diagnostic assessment of attention deficit hyperactivity disorder (ADHD) in adults. Existing screening measures for adult ADHD have focused on a younger population. Subsequently, the current study aimed to evaluate the utility and general usability of an adapted four-item screening tool for adult ADHD: a brief version of the Wender Utah Rating Scale (WURS-brief), within a middle-aged population. The sample consisted of 69 adults, aged between 30 and 63 (age M= 45, SD=6.95), who had been referred to a specialist adult ADHD outpatients clinic. Using factor analysis, the WURS-brief screening measure was compared to existing ADHD diagnostic tools that were used as reference measures within the analysis. The WURS-brief had respectable sensitivity when compared with existing diagnostic tools. This study highlights the importance of validating brief screening measures for middle-aged adults with ADHD within clinical settings and offers suggestions for future research.

Resumen.
El uso de herramientas de detección es un enfoque efectivo y práctico dentro de la evaluación de diagnóstico clínico del trastorno por déficit de atención con hiperactividad (TDAH) en adultos. Las medidas de detección existentes para el TDAH en adultos se han centrado en una población más joven. El presente estudio tuvo como objetivo evaluar la utilidad y la usabilidad general de una herramienta de detección de cuatro ítems adaptada para el TDAH en adultos: una versión breve de la Escala de Calificación Wender Utah (WURS-brief), dentro de una población de mediana edad. La muestra consistió en 69 adultos, con edades comprendidas entre 30 y 63 años (edad M = 45, DE = 6.95), que habían sido remitidos a una clínica especializada para pacientes externos con TDAH en adultos. Mediante el análisis factorial, la medida de detección breve de WURS se comparó con las herramientas de diagnóstico de TDAH existentes que se utilizaron como medidas de referencia dentro del análisis. El WURS-brief tenía una sensibilidad respetable en comparación con las herramientas de diagnóstico existentes. Este estudio destaca la importancia de validar breves medidas de detección para adultos de mediana edad con TDAH dentro de entornos clínicos y ofrece sugerencias para futuras investigaciones.

Keywords.
ADHD, Adult ADHD, Assessment, Validity, Screening, WURS, Wender Utah Rating Scale.

Palabras Clave.
TDAH, TDAH en adultos, Evaluación, Validez, Screening, WURS, Wender Utah Rating Scale.

1. Introduction

Attention deficit hyperactivity disorder (ADHD) is a common neuropsychiatric disorder characterised by a pattern of inattention, hyperactivity, and impulsivity (American Psychiatric Association, 2013). Despite evidence of its prevalence and persistence into adulthood, ADHD is still widely recognised as a childhood psychiatric disorder (Mannuzza & Klein, 2000). Longitudinal studies have demonstrated the development of childhood ADHD into adult ADHD (Barkley et al., 2002; Biederman et al., 2010; Kessler et al., 2005; Rasmussen & Gillberg, 2000; Yoshimasu et al., 2018), as well as recent research demonstrating the persistence of ADHD into early adulthood and middle age (Barbaresi et al., 2013; Caspi et al., 2005; Mannuzza et al., 2004; Mordre et al., 2011). In spite of knowledge that ADHD persists into adulthood, it is evident that adult ADHD has still only recently become a focus for research. Although research has been able to investigate the progression of ADHD into early adulthood, information focusing on ADHD in middle-aged adults is still scarce, despite a rapidly growing aging population. Service provision for adults with ADHD is limited in many Western countries and close to non-existent in other parts of the world. There is an increasing demand on the health-service to support the rise in middle-aged adults reporting a suspected history of ADHD (Das et al., 2012; Manor et al., 2011). Diagnostic ascertainment for this group is therefore vital, with importance in finding efficient ways of screening for this disorder.

Due to ADHD diagnostic criteria being originally developed for children (Applegate et al., 1997), manifestations of symptoms are more easily identifiable in younger populations. It was not until the Fourth Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV;APA, 1994) that criteria for diagnosing adults with ADHD were included. The ADHD diagnostic criteria in the Diagnostic and Statistical Manual of Mental Disorders (Fourth Edition, Text Revision; DSM-IV-TR; APA, 2000) was further altered in the latest edition (Fifth Edition; DSM-V; APA, 2013) to recognise the different symptom presentations of ADHD in both childhood and adulthood. Despite this, diagnosing ADHD in mid to late adulthood has potential additional barriers. This could be due to cognitive changes in adults (i.e. executive functioning shortfalls, attention deficits, decline in working memory; Alderson et al., 2013; Schweitzer et al., 2000), being misinterpreted as executive function deficits found as a part of ADHD presentation. Subsequently, these errors could also cause an increase in the number of false-positive ADHD diagnoses received by middle-aged adults (Guldberg-Kjär & Johansson, 2015). In addition to all of these challenges, there is an increasing clinical demand for the assessment of ADHD in adults (Murphy & Adler, 2004; Murray & Weiss, 2001); therefore, highlighting the need to find reliable tools that accurately identify symptoms in adults.

Using screening tools alongside diagnostic measures is cost-effective and could potentially save time for clinicians. In most clinical settings, the use of multiple comprehensive diagnostic interviews and assessments tends to be a less practicable (Daigre et al., 2013; Daigre Blanco et al., 2009). Screening tends to be used in the initial stage of the diagnostic process, beginning an effective and timely journey towards diagnosis and subsequent treatment (Corbisiero et al., 2017). The use of a valid and reliable screening tool enables clinicians to identify individuals with significant presentations of ADHD symptoms, and administer comprehensive diagnostic assessments if the screening outcome is positive (Young et al., 2016).

Due to the high prevalence of comorbidities in adult ADHD (Faayad et al., 2007), it is vital to explore how to adequately recognise ADHD in and amongst other disorders. Screening tools have been recognised as an important means of identification for the adult ADHD population (Corbisiero et al., 2017).

The Wender Utah Rating Scale (WURS; Ward et al., 1993) is an instrument that has been used widely in the detection of ADHD-associated childhood symptomatology amongst adults. The shortened version of the WURS (Stein et al., 1995) has since been recognised as a useful screening tool used to identify adults with ADHD within non-ADHD populations (Dakwar et al., 2012; Matas & Stanley, 1998; Ward et al., 1993). Using exploratory factor analysis, Guldberg-Kjär and Johansson (2009) identified the four items with the highest loading on each factor from the 25 items originally analysed by Ward et al. (1993) (Stein et al., 1995). These four items were then used for attrition analysis, thus creating a Swedish short version of this instrument (which shall be referred to in the currently study as the WURS-brief). Due to these items effectively demonstrating the highest predictors of persistent ADHD in adults, it is likely that they are also effective in screening for adult ADHD. Due to the WURS (Stein et al., 1995) being regarded as a time-consuming tool (Dakwar et al., 2012), the WURS-brief would be an appropriate substitute.

The present aimed to investigate the psychometric properties and clinical utility of the short questionnaire (WURS-brief; Guldberg-Kjär & Johansson, 2009), in a population of middle-aged adults referred to an ADHD clinic.

2. Method

2.1 Participants

The sample consisted of 69 adults, aged between 30 and 63 (age M=45, SD=6.95). Participants were recruited from a series of patients referred to adult ADHD outpatient clinics across four locations.

Participants recruited to the study were open to the service between a data collection period of nine months and desired sample size was set at N=60. All participants included in the study had to have completed their psychiatric diagnostic assessment and received the outcome before the data collection period ended. Study inclusion criteria was that participants were required to be above the age of 30, and willing to complete the WURS-brief questionnaire. As identified by their patient records, adults with moderate or severe learning disabilities, organic brain injury or poor command of English were excluded from the study. Seventy patients were excluded (one patient had a learning disability and lacked capacity to consent, 57 patients were not contactable, and 12 patients refused participation), remaining a total number of 69 participants in the study (Figure 1). There were 8 participants (11.6% of the total sample) who were not diagnosed with ADHD and therefore were the healthy control group.

2.2 Instruments

2.2.1 Psychiatric diagnostic assessment.

The conclusion of a psychiatric diagnostic assessment was determined through the reporting of an International Classification of Diseases (10^{th} Revision; ICD-10; World Health Organization, 2016) code on the participants' ePJS record and psychiatric assessment report. The ICD-10 is a medical classification system that lists diagnostic criteria for conditions and diseases (WHO, 2016) and is the standard tool used in the United Kingdom in clinical psychiatric settings. Due to the diagnoses included in the study being within the last ten years, and there not being any change to the ADHD ICD-10 coding system since then, the current study followed the 2008 ICD-10 (World Health Organization, 2008) list, and identified ADHD diagnoses to include the following diagnostic codes: Hyperkinetic disorders (F90) and its sub-types: Disturbance of activity and attention (F90.0), Hyperkinetic conduct disorder (F90.1), Hyperkinetic Other hyperkinetic disorders (F90.8), Hyperkinetic disorder, unspecified (F90.9).

2.2.2 CAADID.

The CAADID is a widely used semi-structured interview developed to examine ADHD symptoms categorically and determine whether a diagnosis is present or not (Ramos-Quiroga et al., 2012; Ramos-Quiroga et al., 2019). The measure has been shown to be valid in its ability to distinguish healthy controls from adults with ADHD, along with having acceptable test-retest reliability (Epstein & Kollins, 2006).

2.2.3 DIVA.

The DIVA (Kooij & Francken, 2010) is a structured interview based on the DSM-IV criteria for ADHD (Kooij et al., 2017; Pettersson et al., 2018). Research has previously explored the criterion validity of the DIVA diagnostic tool and suggested its high (100%) diagnostic reliability and good concurrent validity with other self-report scales such as the WURS (Pettersson et al., 2018; Ramos-Quiroga et al., 2019). Sensitivity and specificity values for overall diagnosis using the DIVA 2.0 have been found to be high (90.0 and 72.9 respectively), according to Pettersson et al. (2018). Although DIVA-5 is the most recent version of the measure available, DIVA 2.0 was used within the current study due to it being the measure used within routine clinical practice at the time of data collection.

The diagnostic outcomes for each type of diagnostic assessment were confirmed using the Trust's patient records database (ePJS).

2.3 Procedure

All patients were contacted through telephone. Additionally, patients who were not contactable by telephone were also emailed correspondence about the study if their email address was recorded on the patient records database (electronic Patient Journey System; ePJS). Patients were then informed of the purpose for contact and were either read the information sheet over the phone by the researcher, or were presented with the document as an attachment, if the mode of contact was email. Participants were provided with the aims and details of the study and were required to provide consent-either verbally, or by replying to the initial research email sent to them. Before and after the study, participants were also informed of their right to withdraw. Participants' informed consent was recorded on a data spread-sheet and ePJS.

The WURS-brief (adapted from Guldberg-Kjär & Johansson, 2009) was used in this study as a screening tool to estimate childhood ADHD symptomatology and predict the risk of an ADHD diagnosis in adults. The four items included in this study have been adapted from the highest loading items on each factor of the WURS (Guldberg-Kjär & Johansson, 2009): *"Were you anxious and worried as a child?", "As a child, did you often have outbursts or suddenly became very angry?", "As a child, did you 'first think and then act', or were you following your impulses?", and "As a child, did you have difficulties with numbers and/or mathematics?".* Participants were asked to rate each of the four items on a five-point Likert scale, in reference to childhood experiences: Not at all or minimal (=0), To a certain extent (=1), Pretty much (=2), Very much (=3), All the time (=4).

In real-world context, the process of ADHD diagnosis in adults tends to involve more than one diagnostic tool. After screening, patients (and/or informants) are invited to complete a diagnostic assessment (i.e. DIVA, CAADID), which is then commonly followed by a psychiatric diagnostic assessment with a psychiatrist. This study therefore investigates the degree of agreement between the outcomes of the WURS-brief and a combination of tools used within the diagnostic process.

Figure 1

Participant disposition during study

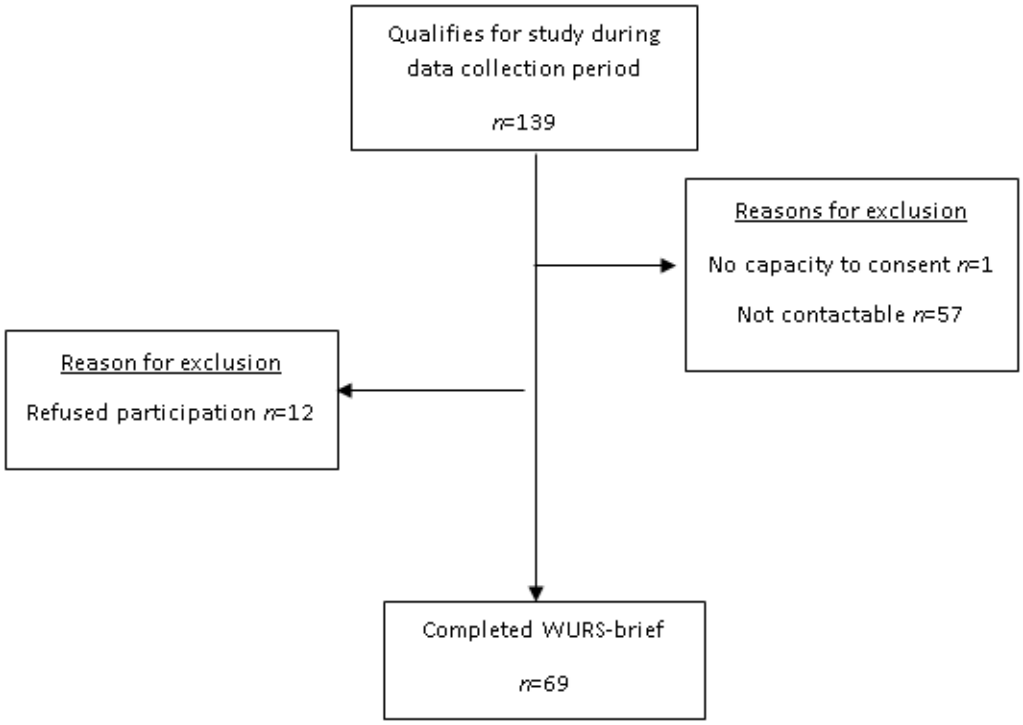


Table 1

WURS-brief and Clinicians diagnostic assessment cross-tabulation

WURS-brief	CAADID		DIVA		Psychiatrist	
	ADHD Positive	ADHD Negative	ADHD Positive	ADHD Negative	ADHD Positive	ADHD Negative
ADHD Positive	10	1	25	12	54	7
ADHD Negative	0	0	4	2	7	1

Note. ADHD=Attention deficit hyperactivity disorder; ADHD positive indicates a score exceeding cut-off; ADHD negative indicates a score below cut-off.

2.4 Data analyses

Outcomes for the WURS-brief, DIVA, CAADID and psychiatric diagnostic assessment were dichotomised into "ADHD positive" and "ADHD negative", based on whether individuals surpassed the cut-off score for each measure.

The psychometric properties of the WURS-brief were investigated using the three diagnostic tools as references of high standard. Two additional variables were generated to investigate the validity of WURS-brief with respect to: The 'DIVA or CAADID', and the 'DIVA or CAADID, and the psychiatrist's assessment'. These variables were formed to reflect realistic use and administration in clinical practice, as well as to test the WURS-brie's clinical utility. Tests of specificity (Mausner & Bahn, 1977; Sparrow, 2010), sensitivity (Mausner & Bahn, 1977; Sparrow, 2010), PPV (Parikh et al., 2008), and NPV (Parikh et al., 2008) were computed for the WURS-brief and arranged in a frequency table (see Table 1) in relation to each of the diagnostic standards individually and in combination.

These validity tests were supplemented by Cohen's Kappa (κ) test, used to determine the general agreement between the referenced diagnostic tools (DIVA, CAADID, psychiatric diagnostic assessment) and the WURS-brief. All descriptive analysis and cross-tabulation procedures were conducted using IBM SPSS Version 26.

3. Results

Descriptive statistics were first computed to determine the characteristics of the sample (Table 3). Frequency distributions did not indicate any missing data for the WURS-brief total score (Figure 2). Fifteen cases were identified where there was no data for either the DIVA or CAADID, as scores for these measures were not made available and therefore were excluded from all analyses pertaining to the DIVA and or CAADID.

Table 2

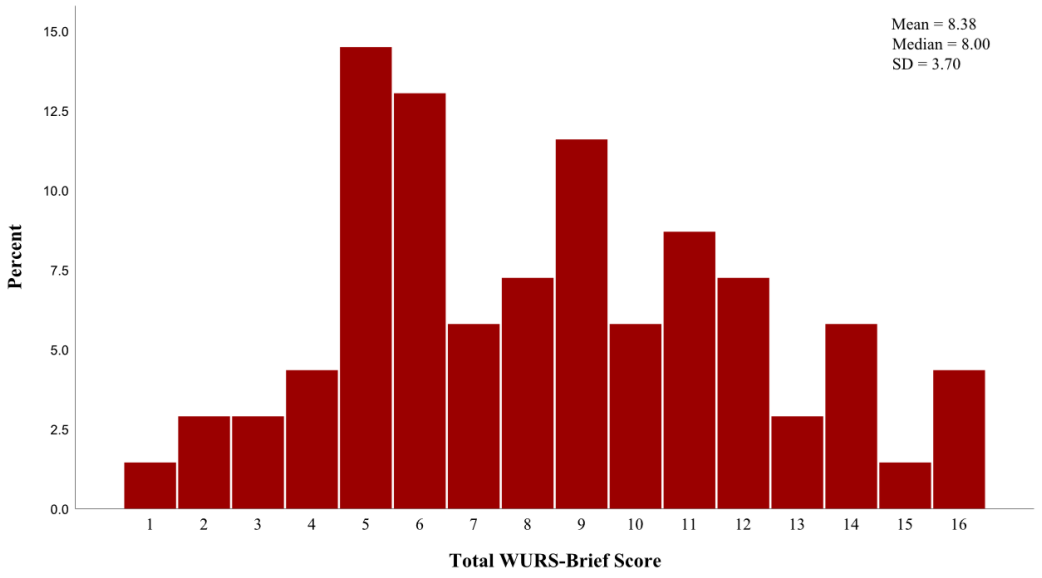
Results for Sensitivity, Specificity, PPV, NPV, and Cohens Kappa (κ) for the WURS-brief

	CAADID	DIVA	PA (ICD-10)	DIVA or[α] CAADID	DIVA or CAADID and[β] psychiatric
Sensitivity	1000.0	82.6	88.5	89.7	88.9
Specificity	.0	14.3	12.5	13.3	11.1
PPV	90.9	67.6	88.5	72.9	66.7
NPV	–	33.3	12.5	33.3	33.3
κ	.00	.006	.010	.038	.00

Note. All values in the table represent percentages except κ. PPV=positive predictive value; NPV=negative predictive value; CAADID=Conners' Adult ADHD Diagnostic Interview for DSM-IV, dichotomised as ADHD if six or more symptom criteria are present in both adulthood and childhood, and in either or both of the domains Attention Deficit and Hyperactivity-Impulsivity, and as ADHD-negative if fewer than six symptom criteria are present; DIVA=Diagnostic Interview for ADHD in Adults, dichotomised as ADHD if both five or more symptom criteria in adulthood and six or more in childhood are present, and in either or both of the domains Inattention and Hyperactivity-Impulsivity, and as non-ADHD if fewer than six or five symptom criteria are present in the respective categories; Psychiatric=psychiatric diagnostic assessment, dichotomised as ADHD if ICD-10 code of F90, F90.0, F90.1, F90.8 or F90.9 are given post full diagnostic interview with clinician, and ADHD negative if another diagnostic code is given.
[α] 'or' indicates that the outcome on either assessment determined the diagnosis;
[β] 'and' indicates that the outcome of the combined means was required to determine the diagnosis.

Figure 2

Distribution of total brief Wender Utah Rating Scale (WURS-brief) score in the study sample (N=69)



Descriptive analyses were also conducted for the WURS-brief total scores. The mean WURS-brief score in the total sample was 8.38 (SD=3.71, Median=8, Range: 1–16). Sixty-one (88.4%) individuals in the sample (25 female, 36 male) scored above the computed cut-off score of five or more (for total sample distribution of the WURS-brief score, see to Figure 2). The mean score for participants with a positive ADHD outcome from the psychiatric assessment was 9 out of 16 (88.4%), with 54 (88.5%) of them scoring above 5 on the WURS-brief. Amongst those with a positive ADHD outcome on the CAADID, 10 (90.9%) participants scored 5 or more, with a mean score of 10. For those who had an ADHD outcome on the DIVA, 25 (86.2%) of the individuals scored above the cut-off, with a mean score of 9.

In regards to the psychiatric diagnostic assessment, the group with the outcome of ICD-10 F90.1 (Hyperkinetic conduct disorder) had the highest WURS-brief score average (M=12.00, SD=4.00).

The mean WURS-brief score for males was 8.31 (SD= 3.68) and 8.48 (SD=3.81) for females, with no significant difference between the two groups ($t_{67} = .38$, $p = .85$).

3.1 Validity of the WURS-brief

The sensitivity, specificity, PPV, NPV, and Cohen's Kappa (κ) were determined for the WURS-brief in respect to the diagnostic references of high standard, as well as the validity of the WURS-brief in agreement with the diagnostic tools combined (Table 2).

3.2 Degree of agreement with clinicians diagnostic tools

The WURS-brief emerged with the highest level of sensitivity (100%) and PPV (90.9%) when used with CAADID. The sensitivity of the WURS-brief was very good when used with the DIVA (82.6%) and psychiatrist's assessment (88.5%), despite poor levels of specificity in relation to all three diagnostic instruments. The general degree of agreement (κ) between the WURS-brief and the diagnostic tools was poor for all outcomes (Table 2).

3.3 Degree of agreement with combined diagnostic tools

When computing the validity of the WURS-brief with respect to the DIVA/CAADID, the sensitivity was very good (89.7%). Similar levels of sensitivity (88.9%) were also seen for the WURS-brief in relation to the DIVA/CAADID combined with the psychiatrist's assessment. The value of κ (.038,.00) was poor for both combinations.

4. Discussion

The purpose of this study was to conduct analyses of validation for the WURS-brief. All data was evaluated using descriptive analyses and cross-tabulation procedures to determine the criterion validity of the WURS-brief.

As the ADHD population continues to age and the clinical demand for adult ADHD assessment is increasing, it is vital that the diagnostic process is made more effective (Asherson et al., 2014). Previous research suggests that individuals in mid-adulthood have more difficult experiences during the diagnostic process, due to lack of reliable informants for childhood behaviours (Henry et al., 1994). Further research supports this finding and suggests that, even for individuals in early adulthood, both the individuals and their parents have limited ability to recall childhood presentations retrospectively (Barkley et al., 2011; Miller et al., 2010). Despite this, diagnostic procedures have yet to be streamlined, and although there has been a review of existing screening tools available (Taylor et al., 2011), there is a limited number of screening tools able to efficiently and effectively identify the risk of adult ADHD diagnosis within a clinical setting (Adult ADHD Self-Report Scale; Adler et al., 2006). As previously mentioned, the WURS has been criticised for its length and time-consumption as a screening tool (Dakwar et al., 2012); therefore, identifying the need for a brief and effective screening tool for ADHD in adults. After Guldberg-Kjär and Johansson (2009) identified the four items with the highest loading on each factor of the WURS (Ward et al., 1993) and used them as a tool for attrition analysis, these four items (WURS-brief) were identified as the highest predictors of persistent ADHD in adults. For the current study, the aim was to therefore use the WURS-brief as a screening tool and validate its use as an identifier of diagnostic risk in adults referred for ADHD assessment.

This study investigated the validity of the WURS-brief as a screening instrument for adult ADHD, based on clinical references of high clinical standard. Despite previous studies (Dakwar et al., 2012) identifying the validity of the 25-item WURS as a reliable screening tool, the current study was the first to explore the utility and the validity of a brief version of the WURS as a screening tool.

With respect to the widely used clinical diagnostic tools, the WURS-brief's ability to identify individuals with ADHD was 'very good' according to Sparrow's 2010 evaluation of values. In relation to the CAADID, the WURS-brief correctly identified 100% of the ADHD cases. The WURS-brief was also able to correctly identify 82.6% of the ADHD diagnoses made with the DIVA, and 88.5% of those identified through the psychiatric assessment. When calculating the degree of agreement between the WURS-brief and use of either the DIVA or CAADID alongside a psychiatrist's assessment, it was able to correctly identify 88.9% of the ADHD cases. In addition, the PPV for the WURS-brief in regards to each of the clinical diagnostic tools (DIVA, CAADID, psychiatric diagnostic assessment) ranged between 67.6% and 90.9%. Amongst those who had a positive ADHD screening result, the probability of receiving a diagnosis of ADHD with the DIVA was 67.6%. The probability of a receiving a positive ADHD outcome on the WURS-brief and also receiving a diagnosis with the CAADID or psychiatric assessment were much higher, with positive predictive values of 90.9% and 88.5% respectively. These findings are mostly supportive of the WURS-brief's use as a valid screening tool for adults referred for ADHD assessment. The current study's findings are supported by previous studies (Cuesta et al., 2011; Dakwar et al., 2012; Wang et al., 2018) that suggest that high sensitivity is the most important factor of a screening instrument, due to it aiming to detect the maximum number of target cases and overlook the minimum. Alternatively, specificity, negative predictive values were poor for the WURS-brief. In relation to the psychiatric diagnostic assessment and the DIVA, only 14.3% of ADHD negative outcomes were accurately predicted by the WURS-brief, with 0% being predicted in relation to the outcome of the CAADID. Negative predictive values were also low when the references of diagnosis were combined (33.3%; DIVA/CAADID and psychiatrist's assessment). Kappa values for all compar-

Table 3

Sample characteristics

	Number	Percentage
Sex		
Male ($M_{age} = 45$; $SD_{age} = 7$)	37	61.7
Female ($M_{age} = 46$; $SD_{age} = 7$)	23	38.3
ICD-10 Diagnosis Code		
F90	11	18.3
F90.0	34	56.7
F90.1	2	3.3
F90.8	3	5.0
F90.9	4	6.7
Other	6	10.0
Diagnostic Assessment		
CAADID	11	23
DIVA	35	76.1
Psychiatric diagnostic assessment	60	100
Co-morbid disorders		
Affective disorder	18	26
Anxiety disorder	15	21.7
Personality disorder	2	2.9
Other neurodevelopmental disorder	3	4.3

isons were low. These results indicate that among those who had a negative ADHD screening result, the probability of also not receiving a diagnosis of ADHD with the DIVA was low; this demonstrates poor ability to discriminate, and therefore the WURS-brief's struggle to correctly identify participants without ADHD. Such findings confirm the WURS-brief's utility as a screening tool for adult ADHD rather than a diagnostic instrument.

4.1 Clinical Implications

The current study presents both theoretical and clinical implications, with this being the first study to examine the validity of the WURS-brief as a screening tool. The study recognises the clinical relevance of validating a screening tool, and therefore during investigation, reflected the clinical use of the WURS-brief by conducting tests of validity with respect to the diagnostic tools it is likely to be used alongside in application.

The current study also acknowledges the importance of screening ADHD in adults, and therefore contributes to the future development of a 'gold standard' screening tool. With reports of high degrees of positive agreement with multiple clinical diagnostic tools, it is clear that the WURS-brief is on its way to becoming a valuable clinical instrument. Through the development of the WURS-brief as a screening tool, it can be used to quickly and efficiently screen large numbers of the at-risk population of adults. This is especially true due to the brief administration time of 1-2 minutes and its ability to correctly predict a diagnosis of ADHD in adults.

4.2 Limitations

Findings of this study should be carefully interpreted due to the limitations identified. Low specificity found for the WURS-brief could be partially attributed to the fact that all participants were referred to a specialist adult ADHD clinic; this could have subsequently increased the likelihood of ADHD symptoms being detected and the likelihood of participants scoring above cut-off on the screening tool, regardless of whether they received a diagnosis of ADHD or not.

An overall specificity of 11.1% could also be attributed to the unreliability of retrospective self-report measures (Mannuzza et al., 2002; Murphy & Adler, 2004). Due to participants needing to provide retrospective responses when completing the WURS-brief, it is likely that there was an increase in the possibility of inaccurate recall of childhood behaviours and response bias. Similarly, responses may have been affected by a confirmation bias (Rabin & Schrag, 1999) or subjectivity, both of which may have contributed to an overestimation of behaviours associated with ADHD for those without a clinical diagnosis, or an underestimation for those with one. The sample could have also be more inclined to endorse items they believed would support a diagnosis of ADHD (malingering; Ramsey, 2014), in order to validate their referral to a specialist adult ADHD clinic. Subsequently, the effect of bias on the reliability of the WURS-brief as a self-report instrument must be considered. An alternative approach to reduce these biases would be to have an informant (such as a parent, teacher or sibling) confirm or provide an objective response to the screening items.

Due to high concurrent co-morbidity rates amongst adults with ADHD, especially with affective and anxiety disorders (Cumyn et al., 2009), the WURS-brief would not be able to independently conclude whether presenting symptoms are correctly attributed to ADHD or are better explained by a co-morbid disorder.

In addition to respondent bias, the outcome of the study could also have been affected by instrument error. For each item, participants were asked about behaviours "as a child". Despite many legal guidance referring to a child as being under the age of 18 (i.e. The Family Law Reform Act. UK Government Legislation, 1969), various diagnostic tests make reference to specific age ranges (i.e. between the ages of 5 and 12 is referenced in the DIVA 2.0; Kooij & Francken, 2010) when identifying presentation in childhood. As a result of this, there is a possibility that respondents could have misinterpreted what the questions referred to by using these words. Similarly, the frequency expressions used in the Likert scales (i.e. "To a certain extent", "Pretty much", "Very much") left much space for varying interpretations of each question (Gliem & Gliem, 2003; Jamieson, 2004).

Although the researcher was blind to the diagnostic outcomes at the time of data collection, limitations of the study can also be extended to selection bias. Due to the retrospective nature of the recruitment process, many participants were unable to take part in the study, because invalid contact details and lack of response to correspondence requesting consent.

Due to the small sample size of 69 participants, all sub-types of hyperkinetic disorder were collapsed into the ADHD-positive group. This reduced the study's ability to detect differences between the ADHD subtypes. The small control-group size also limits the study's ability to detect significant differences between the ADHD positive and ADHD negative groups. With the scores of the diagnostic assessment measures (CAADID, DIVA) missing for some participants ($n = 15$), sample size also limited the analyses of validity that investigated the degree of agreement between the WURS-brief and the CAADID and/or DIVA.

4.3 Future Considerations

While this study was able to offer insight into the extent of the WURS-brief's validity and utility as a screening tool, it does not explain the overlap in symptomatology between ADHD and other mental health disorders (Mörstedt et al., 2015), as seen in previous studies with the WURS (Stanton & Watson, 2016). This could likely explain the low ability of the WURS-brief to distinguish between ADHD cases and non-ADHD respondents. Additionally, due to the WURS-brief focusing on retrospective recall about childhood presentations, future research could explore an expansion of the items, with information from informants. This could likely increase the validity of the WURS-brief as a screening tool.

Due to the WURS-brief focusing on retrospective recall about childhood presentations, future research could explore an expansion of the items, with information from informants. This could likely increase the validity of the WURS-brief as a screening tool. As previously mentioned, the exploration of the WURS-brief's validity was limited due to sample size and selection biases. Future studies using the WURS-brief should focus on obtaining more responses, so as to acquire a larger sample size.

4.4 Concluding Remarks

High sensitivity suggests that the WURS-brief could be an effective screening tool for ADHD in middle-aged adults within clinical practice. Findings suggest that the instrument appears to be able to correctly predict a diagnosis of ADHD, but is unable to distinguish between other disorders and predict when ADHD is absent. Despite this, previous research has indicated that sensitivity takes priority over specificity in regards to the clinical utility of a screening tool. Outcomes of this study were able to validate the clinical utility of the WURS-brief screening tool used within adult ADHD clinics. Further expansion of the study, however, would better inform the reliability and validation of the WURS-brief.

5. Declarations

5.1 Ethics approval and consent to participate

The study protocol was reviewed and approved by the ethics committees within South London & Maudsley NHS Foundation Trust and the Institute of Psychiatry, Psychology and Neuroscience. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Procedures undertaken were explained to the participants, and written informed consent was obtained subsequently.

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