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Original Research Article

Translation to Malayalam language and validation of Vanderbilt attention deficit hyperactivity disorder diagnostic parent rating scale: a cross-sectional study

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ABSTRACT

Background: There is a need for validated translations of tools in regional languages, to ensure uniformity in the diagnosis of attention deficit hyperactivity disorder (ADHD). The study aimed to translate Vanderbilt ADHD diagnostic parent rating scale (VADPRS) into Malayalam and validate it against INCLEN diagnostic tool for ADHD (INDT-ADHD).

Methods: A cross-sectional study was conducted at a tertiary care referral center for child development and behavioral disorders, during the period of January 2022 to August 2022. Hundred and three (n=103) children in age group of 6-12 years with symptoms suggestive of ADHD were included. Parents who were unable to read Malayalam and children diagnosed with autism spectrum disorder and/or intellectual disability were excluded. Malayalam version of VADPRS was derived through forward-backward translation ensuring content, semantic, and technical validity. Validation of this translated tool was done against INDT-ADHD. As part of psychometric testing, interviews with parents and clinical examination of the children were done. Reliability and validity of the tool was analyzed by appropriate statistical methods.

Results: The translated Malayalam version of VADPRS tool identified 90.3% of children had ADHD. The factor-analysis demonstrated a 2-factor structure. Discriminant validity assessed using student's t test, showed statistically significant mean difference between two extreme groups (p=0.001). Intraclass correlation coefficient was 0.994 showing good test-retest reliability. The Cronbach's alpha value was 0.997 indicating good internal consistency. Scale content validity index was significant with value of 0.95. The tool had a sensitivity of 98.95% (95% CI; 94.27%-99.97%) and high specificity. Negative predictive value of the tool was 90% (95% CI; 56.16%-98.44%).

Conclusions: Translated version of VADPRS showed good validity against INDT-ADHD. It can be recommended for use in the Malayalam speaking population to help in diagnostic process of children with ADHD.

Keywords: Child development, Cross-cultural comparison, Psychometrics

INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is one of the most common neurobehavioral disorders of childhood and can profoundly affect children's academic achievement, well-being, and social interactions.[1]

Early identification of ADHD symptoms and timely interventions can help provide a more efficient and beneficial treatment to help children achieve better social and academic skills. In India the prevalence of ADHD has been reported to be 1.6% to 17.9% in various studies.[2]

The NICHQ (National institute for children's health quality) Vanderbilt assessment scales are used by health care professionals to help in the diagnostic process and to measure the improvements over time with treatment of ADHD in children between the ages of 6 and 12 years.[3] It includes parent and teacher rating scales for initial assessments and follow-ups. While the VADPRS was developed for the DSM-IV criteria, it is worth noting that the VADPRS is still consistent with the current version (DSM-5) for ADHD, as criteria for diagnosis of the disorder in children did not change between versions.[4] The VADPRS can be used to assess the presence of diagnostic behaviors, comorbidities, and level of impairment in one setting (home). This information can then be reconciled with collateral information from the VADTRS or another source in order to assist in the diagnosis of ADHD.[4] The Vanderbilt assessment scales have been validated in both referral and community settings using longitudinal assessment and follow-up.[5,6]

Language is one of the most important parts of any culture. Language and cultural differences impact how ADHD symptoms are understood and identified by non-English-speaking populations when using tools originally developed in English. Skounti et al in their study stated that, factors that may influence prevalence rates of ADHD include, source of information, ethnic and cultural differences, population characteristics, methodology features, and diagnostic criteria.[7] Sperber highlighted in his study[8], the relevance and importance of methodical processes for translation followed by rigorous validation of tools, to enhance research quality and validity. While there are validated rating scales in English, there is a need for validated translations of such tools in regional languages, to ensure uniformity in the diagnosis. It is a necessity for self-rated tools or rating scales to be available in the regional languages and be culturally relevant.[9]

Malayalam is the primary linguistic medium in Kerala, a South Indian state with a population exceeding 3.5 crores. Translation of the tool into Malayalam will improve its effective utilization in a clinical setting with Malayalam speaking population. Therefore, this study aims to translate the VADPRS into Malayalam language and validate it against a standard diagnostic tool, INDT-ADHD.

METHODS

This is a cross-sectional study conducted at a tertiary care referral center for child development and behavioral disorders in the state of Kerala, during the period, January 2022 to August 2022. Permission to use and translate the VADPRS tool was obtained from the author, Dr Mark Wolraich, professor of developmental and behavioral pediatrics, Oklahoma university health centre, USA. Sample size of 122 positive cases and 98 negative cases were needed based on a sensitivity of 80%, specificity of 85%, precision 10%, confidence level 95%, and considering a 50% hospital prevalence of ADHD, 122 being largest between the two, it was taken, and adding a nonresponse rate of 10%, sample size was fixed as 140.The Inclusion criteria was, all consecutive cases of children 6-12 years of age, who visited the child development centre with symptoms of hyperactivity and/or inattention during the study period. Exclusion criteria were, those children who were diagnosed with autism and/or intellectual disability, parents of children who could not read Malayalam and those not willing to participate in the study. The study had two stages; first stage was translation of the VADPRS tool into Malayalam language and the second stage was, validation of the translated version against INDT-ADHD.

First stage: translation of the tool

Translation of the tool was carried out taking into consideration the content, semantic and technical validity. Emphasis was given to evaluate clarity, understandability, naturalness, and appropriateness of wording, while preserving the content and meaning. Translation of the tool was done as per standard guidelines as illustrated in Figure 1.[10]

First step was translation of the original instrument by two bilingual translators to produce two forward translated versions; one translator knowledgeable in health terminologies and other in cultural and linguistic nuances. Comparison of the two translated versions by a third independent translator to formulate a composite version which rectifies any ambiguities or discrepancies were done, there by producing final forward translated version. Blind back translation to English was done by two independent bilingual translators, one of them being knowledgeable in health terminologies and other in cultural and linguistic areas (two distinct background). Comparison of two back-translated versions of the instrument by discussing about any ambiguities or discrepancies and resolving it by a multi-disciplinary team consisting of all translators and researcher to create the pre-final Malayalam version was done. Pretesting of prefinal version with five monolingual samples followed by the process of cognitive debriefing was done to test the comprehensibility and clarity of items. It was also assessed whether the structuring and sequencing of items were in tune with the target audience. There were no changes suggested, and the version was carried forward to next step. The content validity of translated version of the tool was assessed by 10 experts including developmental pediatrician, clinical psychologist, developmental therapists, speech therapists and social workers. Preliminary psychometric testing (Cross-language validity) of Malayalam version was tested in five bilingual samples by asking them to rate the translated version first and then the English version, checking for similarity of responses. Pilot study of Malayalam version among parents of 10 children, belonging to different socioeconomic groups was done. This sample was chosen based on same inclusion and

exclusion criteria of the study. Test-retest reliability was assessed in parents of 20 children by administering the tool twice over 2 weeks interval. The translated tool, refined through the steps mentioned above, was administered on the target sample population during the second stage of the study.

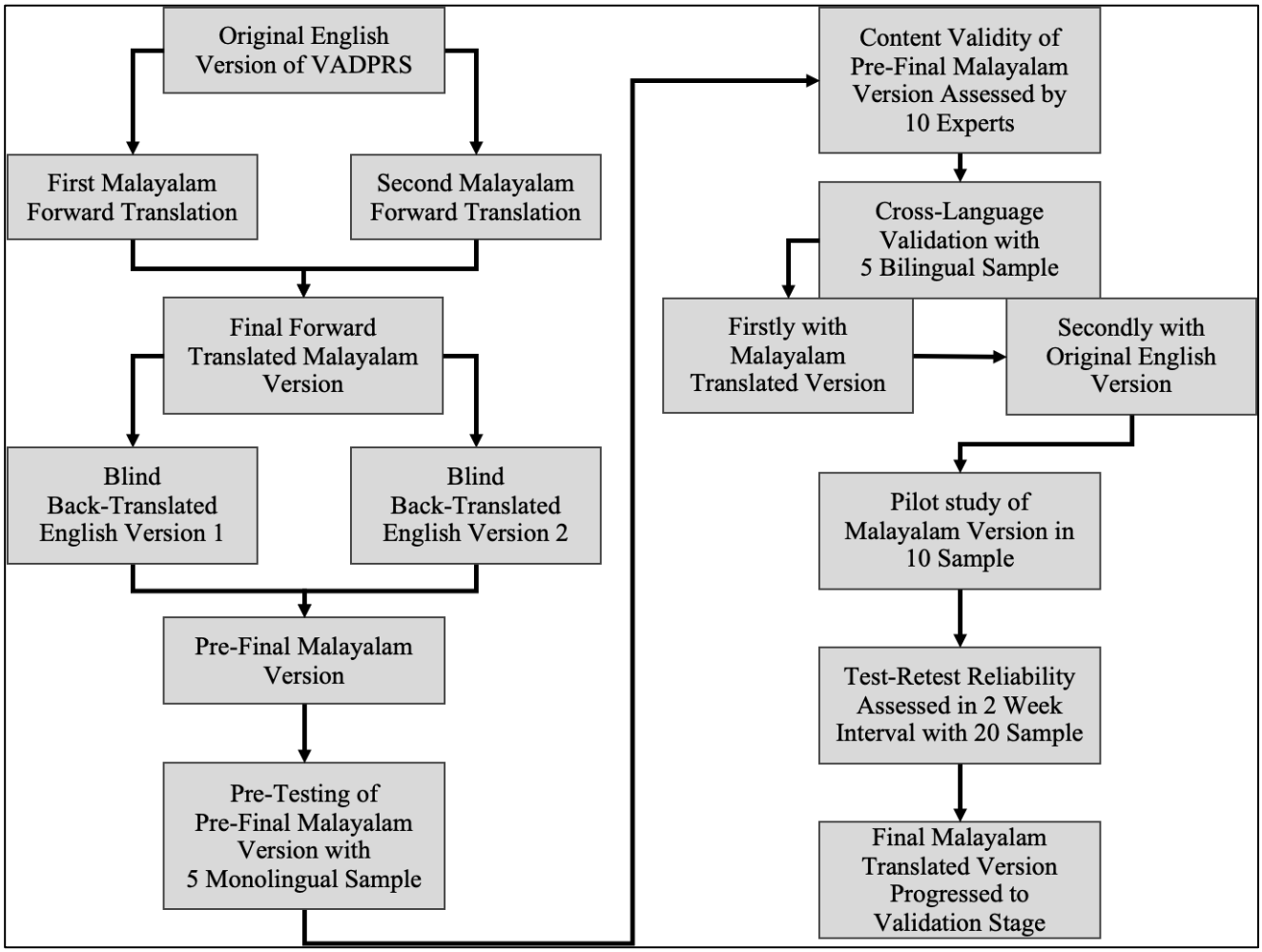

Figure 1: Flowchart for the translation process.

Second stage: validation of the tool

Validation of translated Malayalam version of VADPRS was done against INDT-ADHD. The method of sampling was consecutive sampling. Out of total 109 children who reported with symptoms of ADHD during the study period, 6 were excluded considering the exclusion criteria viz., not willing-1 number; autism-2 numbers; can't read Malayalam-2 numbers; intellectually disabled-1 number. Therefore, sample size of the study was hundred and three (n=103). The parents were informed of the purpose of study, confidentiality was assured, and written consent was obtained. It was explained to them that, their status of participation or non-participation in the study would not affect their care or treatment and they can opt out of the study anytime during the process.

VADPRS initial assessment scales have two components, symptom assessment and impairment in performance and should be completed by a parent of the child. The symptom assessment component, screens for symptoms that meet criteria for both inattentive (items 1-9) and hyperactive ADHD (items 10-18). To meet DSM-IV criteria for ADHD diagnosis, one must have 6 positive responses to either of the inattentive 9 or hyperactive 9 core symptoms, or both. The initial assessment scales also have symptom screens for three other comorbidities, viz., oppositional defiant disorder (ODD), conduct disorder (CD), and anxiety/depression (AD). The second section of the scale has a set of performance measures. To meet criteria for ADHD, there must be at least one item of performance set in which the child shows impaired performance.[11] INDT-ADHD is a diagnostic tool for ADHD developed by Sharmila Mukherjee et al.[12] INDT-ADHD is a tool suitable for diagnosing ADHD in children between 6 to 9 years of age. It has been validated using Connors 3 parent rating scale and DSM-IV-TR criteria. It has 18 components, 9 for inattention, 6 for hyperactivity and 3 for impulsivity. To meet criteria for ADHD, there must be at least 6 positive responses to either the core 9 inattentive symptoms or core 9 hyperactive/impulsivity symptoms, or both.

As part of the psychometric testing, interviews with parents and clinical examination of children were done. Sociodemographic details were collected. Both INDT ADHD and VADPRS tools were used in succession to assess the children. Tool to be used first was assigned randomly. Principal investigator administered one of the tools and a different specialist who is trained in use of both the tools administered the second tool with each patient, while both were blinded of each other's scores. Factor analysis was performed to evaluate the factorial structure of tool. The discriminant validity of the tool was assessed by testing a significant difference between the extreme groups by categorizing participants into two groups based on the cut off score and comparing the mean scores of the two groups using independent's' test.

Ethical considerations

The study protocol was approved by the authorized institutional ethics committee. Written informed consent in the regional language was obtained from the parents of children who were enrolled in the study.

Statistical analysis

Data were analyzed using SPSS version 26.0. Exploratory factor analysis was done to assess the factorial structure of the tool. Intra class correlation coefficient was derived to assess test-retest reliability. Cronbach's alpha statistics was used to check the internal consistency of all items. Content validity index of the translated tool, item wise and for the total scale, was assessed. Criterion validity was assessed-using sensitivity, specificity, positive and negative predictive values at the identified cut-off values.

RESULTS

The sociodemographic details of the children, who were enrolled for the study (n=103) are presented in Figure 2.

The translated VADPRS tool identified that 90.3% children from the enrolled population had ADHD, and further identified the subtypes as ADHD-inattention (40.8%), ADHD-hyperactivity (5.8%), and ADHD-combined (43.7%). INDT-ADHD tool identified that 91.3% of the enrolled population had ADHD. Factor analysis of first 18 items of the tool indicating ADHD was done. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy showed a value of 0.812, indicating the sample size was adequate for the study. Bartlett's test of sphericity showed that the data was suitable for factor analysis with a chi-square value which was significant (<0.001). The factor-analysis demonstrated a two-factor structure for the Vanderbilt ADHD questions. All the items loaded distinctly in the two factors of inattention and hyperactivity with a minimum factor loading of 0.4 and explained a cumulative variance of 100%. The initial eigenvalues and the factor loadings are presented in Table 1. Discriminant validity of the tool, assessed by comparing the mean scores of the extreme groups, by Student's t-test found a statistically significant difference (p=0.001).

The translated version of VADPRS was administered to parents of 20 children and was repeated after two weeks to evaluate stability of the tool for test-retest reliability; intra-class correlation coefficient (ICC) was calculated for the total scale as 0.994. The result shows good test-retest reliability for specific domains also (Table 2).

The Cronbach's alpha value as presented in Table 3 indicates a good internal consistency for the tool as a whole, which was 0.997. Content validity index (CVI) of the tool was calculated. The value of more than 0.78 for item-content validity index (I-CVI) was taken as relevant. All the items in the tool had CVI of more than 0.78.

The scale-content validity index (S-CVI) of the translated tool was 0.95 showing that the translated version had excellent content validity. The criterion validity of the tool as assessed against INDT-ADHD showed sensitivity of 98.95% (95% CI; 94.27%-99.97%) and specificity of 100% (95% CI; 66.37%-100%) at the identified median cut off score of nineteen. Positive predictive value was 100% and the negative predictive value 90% (95% CI; 56.16%-98.44%). The diagnostic accuracy of the tool was 99.04% (95% CI; 94.76%- 99.98%).

Table 1: Percentage variances and factor loadings.

Components	Initial eigenvalues			Factor loadings
	Total	% of variance	Cumulative %	
1	5.97	33.14	33.14	2.442
2	1.85	10.29	43.43	1.361
3	1.45	8.04	51.47	1.203
4	1.28	7.10	58.57	1.130
5	1.03	5.73	64.30	1.016
6	0.87	4.83	69.12	0.932
7	0.81	4.50	73.62	0.900
8	0.77	4.27	77.89	0.877
9	0.66	3.69	81.58	0.815
10	0.56	3.13	84.71	0.751
11	0.51	2.80	87.52	0.711

Continued.

Components	Initial eigenvalues			Factor loadings
	Total	% of variance	Cumulative %	
12	0.48	2.67	90.19	0.693
13	0.40	2.20	92.38	0.628
14	0.36	2.00	94.38	0.600
15	0.32	1.78	96.16	0.566
16	0.28	1.56	97.72	0.530
17	0.25	1.37	99.09	0.496
18	0.16	0.91	100.00	0.405

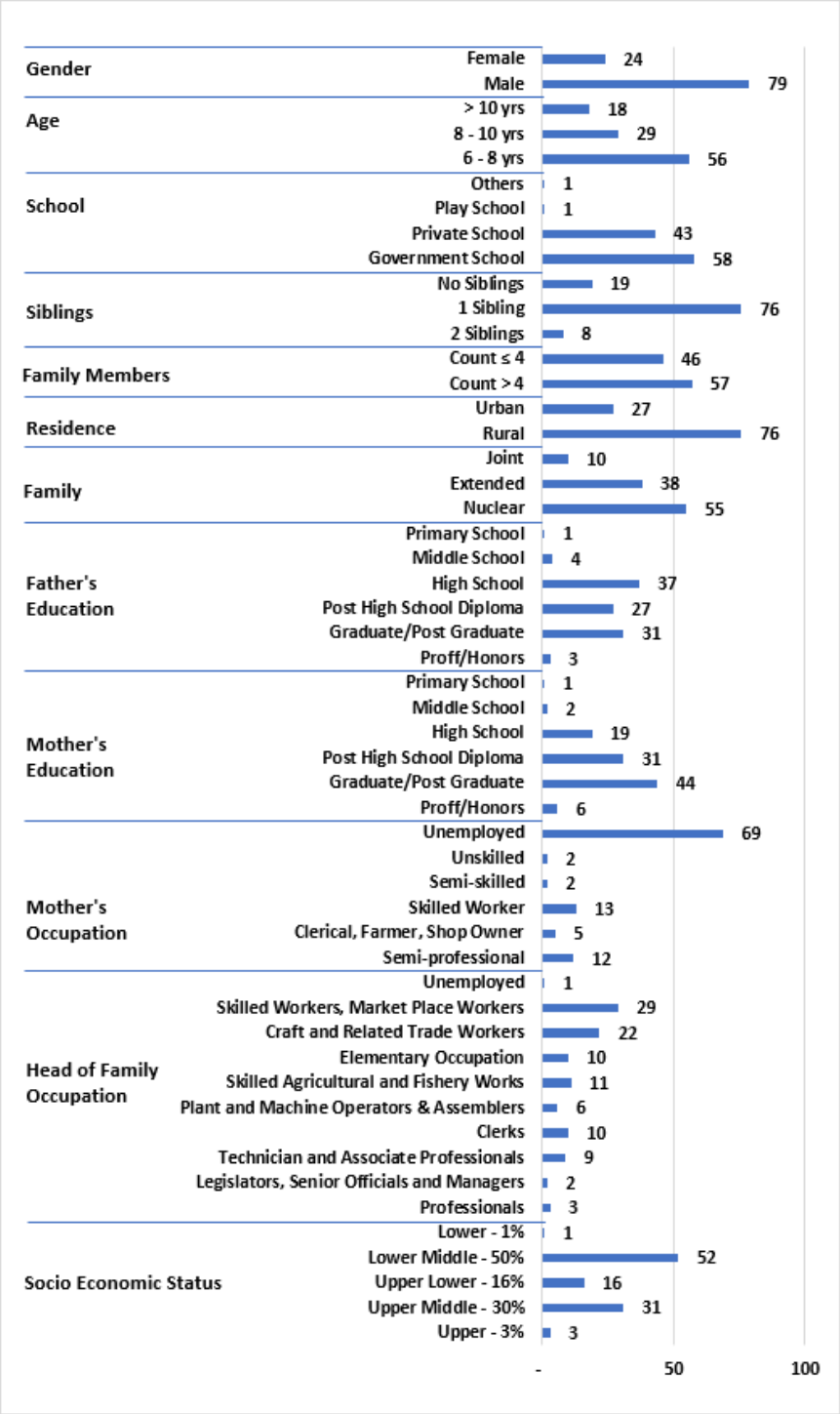

Figure 2: Sociodemographic characteristics.

Table 2: Test-retest reliability statistics.

Score	ICC	95% CI	Significance
Total score	0.994	(0.985, 0.998)	0.001
ADHD-inattention	0.927	(0.825, 0.970)	0.001
ADHD-hyperactivity	0.962	(0.825, 0.980)	0.001
ADHD combined	0.984	(0.960, 0.994)	0.001
Oppositional defiant disorder	0.998	(0.989, 0.999)	0.001
conduct disorder	0.988	(0.971, 0.995)	0.001
anxiety/depression	0.999	(0.991, 1.000)	0.001

Table 3: Analysis of internal consistency.

Domain score	N	Cronbach's alpha
Total score	47	0.997
ADHD-inattention (Q1 to 9)	9	0.962
ADHD-hyperactivity (Q10 to 18)	9	0.996
ADHD combined (Q1 to 18)	18	0.992
Oppositional defiant disorder (Q19 to 26)	8	0.995
Conduct disorder (Q27 to 40)	14	0.994
Anxiety/depression (Q41 to 47)	7	0.999

DISCUSSION

Our study validated the Malayalam translation of the VADPRS against INDT-ADHD and observed that the translated tool is reliable and valid for assessing ADHD in children aged 6 to 12 years. The translated tool has good psychometric properties, comparable to the study conducted for the original English VADPRS tool, that was done in referred high-risk sample by Wolraich et al.[5] The Cronbach's alpha value for the Malayalam version was 0.997 in comparison with the original study (alpha>0.90).[5] Kapogiannis et al reported high internal consistency for the Greek version of VADPRS and stated that it may be used as an accurate psychometric instrument to diagnose ADHD.[13] Similar to the original version, the Malayalam translated tool showed an expected two-factor model where items 1 to 9 constitute ADHD-inattention and 10 to 18 constitute ADHD-hyperactive/impulsive.[5]

The Czech translation of VADPRS by Sebalo et al suggested that the VADPRS can be an essential adjunct to systematic clinical assessment that confirms full criteria for ADHD are met.[14] Their study showed a high positive predictive value of 96% which is comparable to our study. Luisa et al in their cross-sectional study translating the VADPRS into Filipino language, reported high specificity of 98% which compares to our current study.[15]

A limitation to our study is that, as the study was conducted in a tertiary care setting in Kerala, the cases were limited to patients visiting this facility and it may not be representative of the general population. However, the translated tool is likely to be used primarily in similar settings. The prevalence of ADHD is expected to be higher in the referred population. This could explain the high percentage of the enrolled population screening positive for ADHD in our study by the translated tool (90.3%) as well as the INDT-ADHD tool (91.3%). Sample size was calculated for a prevalence of 50% while the actual prevalence was more than 90%. Hence the calculated 140 cases were too low to get a precise estimate of specificity and hence the wide confidence interval (CI) for specificity. The estimated sample size also could not be achieved due to the limited duration of study period. Sperber highlights specific methodological problems in cross-cultural research as mostly relating to, translation quality and comparability of results in different cultural and ethnic groups.[8] Validated translations such as our study, can help improve effectiveness of cross-cultural research in healthcare and provide a more effective reach within the community.

CONCLUSION

In conclusion, the Malayalam-translated version of the VADPRS demonstrated strong reliability and validity against the INDT-ADHD tool. This adaptation allows parents who are proficient in Malayalam but less familiar with English to effectively utilize the scale. Healthcare professionals can make use of this validated tool in Malayalam speaking population across India to deliver uniformity in diagnosis of ADHD. It also ensures global comparability and facilitates cross-cultural research.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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