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Abstract

Autism is an increasingly prevalent developmental neurological condition that manifests in pervasive impairments in social interaction, communication, and stereotypic behavior and interests. Early identification leads to positive long-term outcomes. At present, all standardized rating instruments are written in English; therefore, the purpose of the present study was to adapt the *Gilliam Autism Rating Scale-2* from English into Spanish using the state-of-the-art procedures described in the literature. The English instrument was translated into Spanish, back-translated into English, and then revised using an iterative process. The adapted instrument's psychometric qualities were substantiated. An alpha coefficient of .96 verified the adapted instrument's internal consistency. Results from test-retest comparisons verified the instrument's time stability. The instrument's discriminative validity was confirmed using analysis of variance; the autism group had significantly higher scores than did the other diagnostic groups. Factor analysis verified the construct validity as the items loaded into three clusters that corresponded to the defining characteristics of autism: social interaction, language, and stereotyped behaviors. This culturally and linguistically appropriate assessment tool could be an important instrument for autistic children with Spanish-speaking parents who would otherwise be disenfranchised in regards to early intervention services.

Keywords: Gilliam Autism Rating Scale, Autism, Spanish, Assessment

The Spanish Adaptation of the *Gilliam Autism Rating Scale-2*: Translation and Psychometric Analysis

Autism is a neurological condition, typically noticed before age 3, that is manifested in pervasive developmental delays and impairments in social interaction and communication coupled with repetitive and restricted patterns of interests and behaviors (Centers for Disease Control and Prevention [CDC], 2006). No group is excluded from this condition; socioeconomic status, ethnicity, geographical areas, language, and race do not define it or limit it (Autism Society of America [ASA], 2007). There are several subtypes of these pervasive developmental disorders, which are collectively referred to as Autism Spectrum Disorders (ASDs). The most common ASDs are Autistic Disorder, Asperger's Disorder, and Pervasive Developmental Disorder Not Otherwise Specified (Kogan et al., 2009).

What is known is that autism prevalence is increasing (CDC, 2007a), and early identification and intervention are crucial prerequisites for positive long-term outcomes (Conrood & Stone, 2005). In 1980 autism was estimated to occur in 2 to 4 of every 10,000 children (APA, 1980). However, the number of children with an ASD has increased dramatically since that time. The CDC (2009) estimates a prevalence rate ranging from 1 in 80 to 1 in 240 births. Similarly, Kogan and colleagues (2009) estimate that 1 out of 91 children are born with an ASD.. While autism is not selective with regard to socioeconomic, ethnic, geographical, linguistic, and racial factors (ASA, 2007); reported cases of autism for Hispanics[1] lags behind that of non-Hispanics. In 2002, the Autism Developmental Disabilities Monitoring Network (ADDMN), a research group funded by the CDC (2007b), estimated the ASD prevalence rates for White, non-Hispanics to be 3.3 to 12.5 per 1,000 eight-year-old children and

[1] For the purpose of this paper Hispanic refers to individuals of Latin American descent living in the United States.

3.4 to 7.7 per 1,000 Black non-Hispanics. In contrast, estimates for Hispanic 8-year-old children were as low as 0.3 per 1000. These lower rates among Hispanics may be due sampling error and cultural reasons rather than to etiology.

Palmer, Walker, Mandell, Bayles, and Miller (2010) provided evidence to substantiate this apparent disparity among ethnicities in regards to the percentage of children identified as having an ASD. In a review of student data obtained from the Texas Educational Agency (TEA), Palmer et al. discovered fewer cases of students being classified under the Autism category in school districts that have a higher percentage of Hispanic students. They attributed this to the fact that Hispanics in Texas are less likely than non-Hispanic Whites to have health insurance and are more likely to live below the poverty line. Consequently, Hispanic Texans are more likely than other groups to not access health services such as autism assessment.

Kogan and colleagues (2009) documented that the disparity between Hispanic prevalence rates and rates from other groups is greater for children who reside in households that speak primarily Spanish and for those who are of low socioeconomic status. They posited that this differential may be due to a lower rate of parents from these groups reporting ASD symptoms in their children. Therefore, is not clear whether this disparity between the prevalence rates for Hispanic versus non-Hispanic children is due to actual ethnic differences in autism prevalence or are instead due to identification and diagnostic practices; however, there is evidence to suggest that these differences are methodological in nature rather than are due to true population differences. For example, the ADDMN 2002 data were collected from 14 states, which did not include states with high Hispanic populations such as Texas, Arizona, New Mexico, or

California (CDC, 2007a). Therefore, the underrepresentation of Hispanics in the 2002 ADDMM data may simply be due to the location of the study.

These racial/ethnic disparities in ASD diagnoses may be also be due to differences among ethnicities in regards to access and utilization of health care services and/or may be due to the unavailability of culturally appropriate assessments (Shattuck & Grosse, 2007). Indeed, there is an under-utilization of mental health services among Hispanics for several reasons, such as financial reasons, strong family and social support systems, and geographical barriers. Results from anthropological and demographic research indicate that perhaps the most important barrier for Hispanics in regards to accessing mental health services is the lack of cultural and linguistically appropriate services (Mezzich, Ruiz, & Munoz, 1999). Providing a culturally sensitive and linguistically appropriate instrument to assess autism for Spanish-speaking Hispanics is a step towards remedying this problem.

Based on an analysis of 2003-2004 parental survey data, the CDC (2006) attributed the under-reporting among Hispanics partially to the fact that autism is recognized through behavioral observation and therefore is often not identified until children reach school age. The CDC concluded that there is a need to improve early detection of autism for Hispanics, which can be addressed through developmental screening and early interventions (CDC, 2006). As developmental screening involves obtaining data from parents about their child's typical behavior, it follows that any survey instrument or questionnaire provided to parents for feedback should be in that person's language.

As the prevalence rate of autism increases faster than the national population growth and the Hispanic population is the most rapidly growing minority group (US Census, 2008), it is

unsettling that early autism diagnosis for Hispanic children in the United States, especially those children whose families speak only Spanish, lags behind other ethnicities (Kogan et al., 2009). One possible reason for this is that all standardized autism screening instruments used in the United States are written in English rather than Spanish (Conrood & Stone, 2005). The situation is similar in Mexico, where a delay in early autism assessment is attributed to the fact that initial evaluations rarely use diagnostic instruments (Hedley, Young, Angelica, Gallegos, & Salazar, 2010; Tuman, Roth-Johnson, Baker, & Vecchio, 2008). One commonly used standardized autism screening instrument is the *Gilliam Autism Rating Scale-2* ([*GARS-2*] Gilliam, 2006). The *GARS-2* has been found to be reliable and valid (Montgomery, Newton, & Smith, 2008). This instrument is a questionnaire with which parents rate a child's behavior and characteristics. At present, there is no Spanish version of the *GARS-2*. Therefore, the purpose of this study was to translate the *GARS-2* into Spanish and verify the revision's validity and reliability with Spanish-speaking parents of children diagnosed with autism.

The *GARS-2* (Gilliam, 2006), a revised version of the original *Gilliam Autism Rating Scale* ([*GARS*] Gilliam, 1995), is a behavioral checklist designed to identify persons with autism. The *GARS-2* was constructed based on two widely accepted definitions of autism, that from the Autism Society of America ([ASA] 1994) and from the *DSM* (APA, 1994, 2000). It is designed to be completed by a parent, parents, or other caregivers/professionals familiar with the child's behavior. It can be completed in 5 or 10 minutes, and unlike other instruments, it requires no professional training to administer (Lord & Corsello, 2005).

The *GARS-2* (Gilliam, 2006) consists of 42 items divided into three subscales: Stereotyped Behaviors, Communication, and Social Interaction. It provides scaled scores for

each of the subscales, an overall autism composite standard score (Autism Index), and percentiles for each of these. The subscales have a mean of 10 and standard deviation of 3. The Autism Quotient and the Autism Index of the *GARS-2* each have a mean of 100 and standard deviation of 15. The *GARS-2* requires respondents to rate the frequency of the examinees behavior on a 4-point Likert scale, ranging from "Never Observed" to "Frequently Observed." The *GARS-2* was normed on 1,107 participants from age 2 through 28 with autism from 48 states.

The research literature has provided standards and practices for revising existing assessment instruments from one language to another. The *Standards for Educational and Psychological Testing* directs testing practice to actively reduce threats to reliability and validity that may be caused by language differences (American Educational Research Association [AERA], 1999). This means that one cannot simply translate an existing instrument into a different language and then use the revised version on a population for which is was not designed. Adapting an instrument written in English to be used for Spanish speakers involves steps beyond the initial translation. There must be a back-translation, an iterative process of review and revision, and then standardization (Bracken & Barona, 1991; Geisinger, 1994). Finally, statistical theory provides methods for checking the validity and reliability of the adapted instrument (Nunnally, 1978).

To summarize, four salient issues drive the necessity of this project to develop a Spanish version of the *GARS-2*: (a) Autism is on the increase (CDC, 2007a); (b) the Hispanic population in the United States is on the rise (US Census Bureau, 2008); (c) the documented prevalence of U.S. Hispanics identified as having autism is less than that of Whites and Blacks (CDC, 2007b);

and (d) at present, most standardized autism screening instruments are in English and normed on only English-speaking respondents.

Method

Participants

This study targeted the population of parents and guardians of children and adolescents in the Rio Grande Valley of South Texas who had been diagnosed with autism and other disorders such as mental retardation and attention deficit hyperactivity disorder (ADHD). These individuals ranged in age from 3 to 16 and they resided with parents or guardians who identified themselves as being Spanish speakers. That is, Spanish was reported as their language of preference in that they speak Spanish, read Spanish, and choose to use Spanish instead of any other language.

In an attempt to ensure that the sample was representative of the Spanish-speaking population in the Rio Grande Valley area of South Texas, parents of children diagnosed with autism were solicited from a four city area: McAllen, Pharr, Edinburg, and Hidalgo. Participants were selected from rehabilitation clinics that provide speech and occupational or psychological services to children with autism spectrum disorders (ASDs). The ASD diagnosis was a requirement for these children to receive services and was confirmed by clinic employees. To insure participant confidentiality, records were not accessed and clinic identification and confirmation of the diagnosis by parent or guardian was deemed sufficient. A total of more than 20 clinics out of approximately 60 clinics in the area from this targeted geographical area agreed to participate. Additional data were collected from Spanish-speaking parents and guardians of

children without an autism diagnosis. These participants were also selected from rehabilitation clinics and psychological clinics from the same geographical area.

A total of 77 individuals having children with autism participated in the study. In addition, the results from these participants were compared to a total of 23 participants whose children did not have autism diagnoses. To ascertain stability reliability, Gilliam measured a small sample (n = 37 out of 1107 total) of individuals diagnosed with autism at the beginning and end of a 2-week period. As this was a much smaller study than Gilliam's in regards to sample size, the goal was to retest at least 20% of the total sample in order to assess stability reliability. A total of 16 participants submitted retests.

Materials and Procedure

The GARS-2 and the GARS-2 Spanish Version. The GARS-2 is a behavioral checklist designed to identify persons with autism. It consists of 42 items divided into three subscales: Stereotyped Behaviors, Communication, and Social Interaction. The *GARS-2* has been found to be reliable and valid (Montgomery et al., 2008). For this study, the *GARS-2* was translated from English into Spanish by a doctoral level school psychologist with fluency in English and Spanish and who was familiar with the content and intent of the original English version of the *GARS-2*. The Spanish version was then back-translated by a bilingual doctoral-level educator who was not familiar with the English version. A committee of individuals fluent in both English and Spanish compared the two versions and made revisions to the Spanish version based on the results of the comparison. The Spanish version was then revised based upon the committee's recommendations.

In a small pilot study, the reviewed and revised Spanish version of the *GARS-2* was administered to a convenience sample of 10 Spanish-speaking parents or guardians of children who had already been diagnosed with autism. The purpose of this step was not to obtain raw scores; but rather, it sought to seek these individuals' comments regarding their comprehension of the items and instructions and to seek further recommendations for revision. Further revisions were then made based upon these recommendations.

Like the *GARS-2*, the Spanish adaptation consists of 42 items divided into three subscales; Stereotyped Behaviors, Communication, and Social Interaction. The instrument requires respondents to rate the frequency of the examinees behavior on a 4-point Likert scale, ranging from "Never Observed" to "Frequently Observed."

Directors of rehabilitation clinics and psychological clinics in the defined geographical area were contacted by telephone, email, and/or in person in order to explain the purpose of the present study and to solicit volunteer participants. Based upon recommendations from the facility's director, those parents who fit the eligibility criteria and who volunteered to participate were assigned an identification number, thus ensuring complete anonymity of the parent and the identified child. Numbered *GARS-2 Spanish Version* protocols were delivered to each participating facility. After participants read the consent form, agreed to participate, and signed the form, they completed the *GARS-2, Spanish Version* either in the waiting rooms while their child was receiving treatment or at their homes.

Participants also completed a demographic survey in order to determine their eligibility for the study. Like the assessment instrument, the survey was completely anonymously in that it did not require either the name of the respondent or identified child. This survey was written in

Spanish and it solicited the following information: What is your dominant/preferred language? What diagnosis does your child have? How old is your child? Once completed, the respondent placed the *GARS-2, Spanish Version* protocol and demographic survey in a provided envelope and initialed the seal. The sealed envelope was placed in a locked file box, which was stored in the rehabilitation clinic until the researcher retrieved it. The data from hard copies were scanned and stored electronically on an encrypted file; the hard copies were shredded.

Results

The purpose of this study was to develop a Spanish version of the *Gilliam Autism Rating Scale-2* ([*GARS-2*], Gilliam, 2006) and to ascertain this revised instrument's psychometric properties. This study adapted the *GARS-2* from English to Spanish using an iterative process of translation, back-translation, review, and revision. Pro-Ed, the publisher of the instrument, granted permission for use the *GARS-2* in this study. The translated instrument was tested on a sample of $(N = 100)$ Spanish-speaking parents from the Rio Grande Valley of South Texas whose children, ages 3 through 16, were diagnosed with an autism spectrum disorder, no diagnosis, or other diagnosis. The psychometric properties under investigation were the adapted instrument's internal consistency, stability, discriminative validity, and construct validity.

Demographic Information

Of the total sample size of 100, a total of 77 participants (77%) indicated that their child had an autism spectrum disorder (autistic disorder, pervasive developmental disorder, Asperger's disorder). The remaining 23 (23%) represented children with ADHD (9), mental retardation (2), other diagnosis (3) or no diagnosis (9). With regard to ethnicity, 92% of the parent respondents reported that their ethnicity was "Mexican" or "Mexican American" and 8% reported "Other."

Internal Consistency

As a measure of the internal consistency among all of the items of the *GARS-2, Spanish Version*, the obtained Coefficient alpha was .96. This value indicates that 96% of the variability between the scores is attributed to the true score. Values above .90 are considered excellent (Yockey, 2011). These results indicate a high degree of internal consistency among the items.

Subscale Correlations

Table 1 displays the correlations between each subscale with each of the other two subscales. The correlations, which ranged from .807 to 829, indicate the scales are highly correlated with one another.

Item to Total Correlations

Item to total correlations were computed for each of the 42 items of the GARS-2, Spanish Version. The Pearson correlation coefficients ranged from .435 to .793. Items with item-total correlations exceeding .35 are considered large enough to be considered a meaningful contribution to the instrument (Hammill, Brown, & Bryant, 1992). These results indicate that each of the items adequately discriminates individuals exhibiting more autistic characteristics from those who exhibit less. Therefore, it was not necessary to exclude any of the 42 items of the instrument.

Test-Retest Reliability

To determine the stability reliability (test-retest) of the *GARS-2, Spanish Version,* participants were asked to complete the instrument again 2 weeks after the first time it was submitted. Of the 100 total participants, 16 returned the retest. Of the returned re-tests, 10 were fully complete; however, six included omitted items and could not be analyzed. The test-retest

comparisons as measured by the Pearson's Coefficient was $r = .98$. This high coefficient indicates that the instrument is stable over time.

Discriminative Validity

A one-way analysis of variance (ANOVA) was used to verify the instrument's discriminative validity. The standard scores were compared between participants with autism spectrum disorders and other diagnostic categories. The analysis was based on a subsample of 87 participants because 13 of the protocols were missing the communication subscale. Participants were instructed to omit this scale if their child was completely nonverbal. Results indicate that the autism group had significantly higher scores than did the other diagnostic groups ($F(6,80) = 17.68$, $p < .01$). Thus, the instrument has strong discriminative validity. These results are graphically displayed in Figure 1.

Factor Analysis

A factor analysis was performed to verify the construct validity of *The GARS-2, Spanish Version*, Specifically, the steps taken in this analysis were Dimension Reduction, Principal Components Extraction, Varimax Rotation, and Factor Extraction with three fixed factors. The original English version, the *GARS-2* consists of 42 items and three subscales (with 14 items each). The first subscale is Stereotyped Behaviors, the second is Communication, and the third is Social Interaction. Items 1 through 14 comprise the Stereotyped Behaviors, subscales, 15-28 measure Communication, and 29-42 measure Social Interaction.

Results indicate that the first component of the *GARS-2, Spanish Version* corresponds to Scale 3 (Social Interaction) of the *GARS-2.* Twelve out of the 21 loadings (57%) were from items of Scale 3 (items 29 through 42). For Component 2, 59% of the items came from Scale 1

(Stereotyped Behaviors). Finally, 100% of the items that loaded on Component 3 were items from Scale 2 (Communication). An examination of the individual items reveals that those items that loaded on components that differed from the subscale origin of that item make intuitive sense. For example, on the Social Interaction Component, which are items 29 through 42 from the original English instrument, item 20 is "Looks away or avoids looking at speaker when name is called." Although this item comes from the Communication Subscale of the *GARS-2*, it loads on the Social Interaction Component of the factor analysis. It does not defy logic that this item measures Social Interaction in addition to Communication. Item 17 comes also comes from the Communication Subscale of the *GARS-2*; however, it loads heavily on the second component from the factor analysis, Stereotyped Behavior. Item 17 is "Repeats words or phrases over and over." This is a description of Stereotyped Behavior in addition to Communication. The rotated component matrix can be found in Table 2.

Discussion

Autism is not selective. It affects the general population regardless of socioeconomic status, ethnicity, geographic location, language, or race (ASA, 2007). As the prevalence rates continue to supersede national population growth, present treatment efforts center around early diagnosis, parent education, and behavioral interventions. Unfortunately, early autism diagnosis for Hispanic children from families who speak only Spanish lags behind other groups (Kogan et al., 2009). This in part may be due to the fact that current standardized autism screening instruments are written in English and not Spanish (Conrood & Stone, 2005). In order for autistic children from Spanish speaking households to receive early interventions, there is a need for assessment instruments available in their language. Therefore, the purpose of the present

study was to translate the *Gilliam Autism Rating Scale-2* ([*GARS-2*] into Spanish and verify the adapted version's psychometric properties.

The product of the present study, the *Gilliam Autism Rating Scale-2, Spanish Version* is a psychometrically sound Spanish adaptation of the *Gilliam Autism Rating Scale-2 (GARS-2)*. It was translated using state-of-the-art procedures for adapting an instrument to another language. As with the original English version, it correctly discriminates between those who do and do not have autism, its factor structure is supported, it has high internal stability, and it is stable over time. The results of the current study are immediately relevant for the site of the study, the Rio Grande Valley of South Texas. Although the translation may be appropriate for other areas as well, caution would need to be used in interpretation with other Spanish speaking populations as there may be cultural and dialectical differences is subsets of the Spanish speaking population. Further psychometric studies of this instrument with larger samples and in other geographical locations are recommended, however, this translation should ultimately make autism identification and early intervention attainable for Spanish-speaking families who would otherwise be disenfranchised.

Although the sample obtained was sufficient in size to verify the instrument's psychometric properties, a limitation of the present study was its small sample size. Although the initial goal was to obtain completed protocols from at least 100 parents of children with autism spectrum diagnoses, after 6 months of active seeking, only 77 participants meeting this criterion were obtained. These participants were obtained from clinics that provide rehabilitative services for children with autism. Administrators from more than 20 individual clinics agreed to participate as community partners; however, despite each partner's initial enthusiasm and

expectations, it was difficult to obtain participants, for several possible reasons. The recruitment occurred at the end of the school year; thus, many potential respondents may have been out of town for the summer. Second, most of the children were transported to the clinics by the clinic-provided transportation rather than by their parents. Thus, it was necessary for the drivers to leave the protocols with the parents to complete at their homes. Unfortunately, most of these parents did not complete the form. Most of the completed forms were obtained by parents who accompanied their children to the clinics.

Recommendations for Further Study

Other possible reasons for the difficulty in recruiting participants could be addressed with future research. As mentioned in the review of the literature, limited health care access among Spanish-speaking parents may be a contributing factor. That is, fewer cases of students may be identified and classified by age 3 among Hispanics because this group is more likely than others to lack health insurance, live below the poverty line, and not access mental health services such as autism assessment (Palmer et al., 2010). One avenue for future study would be to test the hypothesis that children identified prior to school age are those whose parents do access mental health services for them. If this indeed is found to be true, efforts can be made to identify more of these children through community outreach using the *GARS-2, Spanish Version* as a screener.

Another avenue of future research would be to test whether there is consistency between Spanish-speaking parents and Spanish-speaking teachers and other professionals in their identification of autism using the *GARS-2, Spanish Version.* The present study only sought parent and caregiver participants. If it is found that teachers, teachers' aides, and other school and autism treatment personnel are equally likely to identify autism using the *GARS-2, Spanish*

Version, then future efforts should be directed at obtaining a national representative norming sample of participants from this more varied group of respondents.

Finally, several protocols were disseminated to parents who chose not to complete them. One reason may have been the length of the instrument; it requires the respondent to complete 42 items. As the results of the factor analysis conducted in this study indicated that these items clustered around the three constructs of Stereotyped Behaviors, Communication, and Social Interaction, future research might focus on abbreviating the instrument by deleting those items that load the lightest on these scales. A shorter version of the *GARS-2, Spanish Version* would be one avenue to reach more participants as well as to ultimately assess more consumers.

Conclusion

The product of this study is a Spanish version of the *GARS-2.* The results of the statistical analysis of this adapted instrument supported the reliability and validity of this scale. A high degree of internal consistency was found among the items, the scales were found to be highly correlated with one another, each of the items adequately discriminated individuals exhibiting autistic characteristics from those who did not, the instrument was stable over time, it had strong discriminative validity, and it was found to measure the same constructs as the original version. This instrument is now ready to be used and validated with broader samples.

The study is limited by the small sample size and generalizability; however, it is an important first step towards remedying the cultural inequity of autism assessment for Spanish-speaking Hispanics. It is hoped that future research will focus on extending the geographical area of the sample space and increasing the sample size. These aspirations focus on a larger and broader sample size with hopes that the product of the present study, the *GARS-2, Spanish*

Version will ultimately be available for professionals who work with children with Autism throughout the United States.

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Table 1

Subscale Correlations

Subscale	Stereotyped Behaviors	Communication	Social Interaction
Stereotyped Behaviors	1.000	.807	829
Communication	.807	1.000	.812
Social Interaction	.829	.812	1.000

Table 2

Rotated Component Matrix

Item Number	Component 1 Social Interaction	Component 2 Stereotyped Behaviors	Component 3 Communication
20	**.777**	.172	.155
29	**.690**	.307	.169
1	**.673**	.271	.248
4	**.658**	.056	.090
36	**.643**	.347	.223
40	**.632**	.169	.394
21	**.621**	.238	.266
27	**.614**	.210	-.150
41	**.613**	.219	.317
35	**.596**	.185	-.001
38	**.592**	.252	-.102
31	**.559**	.312	.104
19	**.538**	.370	.065
42	**.529**	.337	.374
32	**.521**	.240	.124
33	**.506**	.281	.433
10	**.505**	.437	.069
30	**.466**	.157	.352
23	**.419**	.239	.222
34	**.386**	.360	.298
9	**.349**	.300	.187
17	.056	**.726**	.408
7	.329	**.717**	.215
13	.322	**.705**	-.069

3	.226	**.689**	.023
12	.318	**.675**	-.054
37	.423	**.663**	.162
18	.301	**.647**	.200
15	.239	**.618**	.333
16	.033	**.613**	.554
14	.448	**.552**	-.292
26	.384	**.541**	-.292
39	.402	**.534**	.406
11	.054	**.501**	.275
8	.473	**.500**	.127
6	.199	**.494**	.372
2	.378	**.465**	.188
5	.388	**.401**	.113
28	-.059	.222	**.796**
24	.199	.094	**.702**
25	.151	.070	**.699**
22	.441	-.079	**.554**

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 8 iterations.

Figure 1

Mean raw scores by diagnosis.