The Repetitive Behavior Scale-Revised: Independent Validation in Children with Autism Spectrum Disorders and a Control Group in Albania

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Abstract

A key feature of autism is restricted repetitive behavior (RRB). Despite the significance of RRBs, little is known about their phenomenology, assessment, and treatment. The objective of this study is the vvalidation of the Albanian version of the RBS-R in an independent sample of ASD children. In order to validate the RBS-R in an independent sample, a survey was conducted in Albania at National Center of Childrens' Rehabilitation including 30 children with autism spectrum disorders (ASD) and a control group of 30 children without ASD. Factor analyses produced a five-factor solution that was both clinically meaningful and statistically sound, namely: Ritualistic/Sameness Behavior, Stereotypic Behavior, Self-Injurious Behavior, Compulsive Behavior and Restricted Interests. Measures of internal consistency were good for this five-subscale solution. The effects of baseline characteristics (age and gender) were examined. Cronbach's alpha was used to measure internal consistency. The alpha values for the five subscales, ranged from 0.72 (Stereotypic) to 0.85 (Ritualistic/ Sameness Behavior). All values are within or above the acceptable range for research purposes. The Albanian version of RBS-R appears to have sound psychometric characteristics and can be used to differentiate various types of repetitive behaviors.

Keywords: Autism, Repetitive behavior, Stereotypies, Assessment, Rating scale

Introduction

In recent years, much of the work on the features of autism has focused on core social and communication deficits of the disorder, rather on restricted and repetitive behavior, which is also a core feature (Lewis & Bodfish, 1998; Rutter, 1996).

In order to address more complex RRBs observed in people with autism Bodfish and colleagues expanded the original RBS to include more complex RRBs by adding items assessing ritualized behaviors, insistence on sameness, and restricted interests. This resulted in the current 43-item RBS-R. Items are rated on a four-point Likert scale ranging from (0) ''behavior does not occur'' to (3) ''behavior occurs and is a severe problem,'' and raters are asked to refer to the previous month when completing the scale. The items of the RBS-R have been conceptually grouped (i.e., based on clinical experience) into six subscales. These include: (a) Stereotyped Behavior (movements with no obvious purpose that are repeated in a similar manner); (b) Self-injurious Behavior (actions that cause or have the potential to cause redness, bruising, or other injury to the body); (c) Compulsive Behavior (behavior that is repeated and performed according to a rule or involves things being done ''just so''); (d) Ritualistic Behavior (performing activities of daily living in a similar manner); (e) Sameness Behavior (resistance to change, insisting that things stay the same); and (f) Restricted Behavior (limited range of focus, interest, or activity).

The objective of the present study was to assess the factor structure and some psychometric characteristics of the RBS-R in an independent sample of children with autism spectrum disorders and a control group of children without ASD in Albania. It was hypothesized that the six-factor structure of the RBS-R would be confirmed via exploratory factor analysis.

Method

Participants

The participants in the factor analytic study of the RBS-R were 30 children with autism spectrum disorders (ASD) at National Center of Childrens' Rehabilitation in Tirana, Albania and a control group of 30 children without ASD matched for age and gender in order to assess the effects of subject variables on repetitive behavior.

Instrument

Translational validity was undertaken to ascertain whether the content of the questionnaire was appropriate and relevant to the study purpose. All questionnaires were completed by the same interviewer, thus, eliminating the interviewer's bias.

Data Analysis

The analyses was carried out on the whole sample using the software SPSS 16.0. Mean scores were calculated for both cohorts and compared. A p-value <0.05 indicated statistical significance. Normality of distribution was tested and data of a significant

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nature had non-parametric tests conducted. To evaluate the internal consistency of the measures Cronbach's alphas were calculated for each of the RBS-R subscales and full scale, for the first and second measurement. To examine the construct validity of the RBS-R, exploratory factor analysis was performed first. A principal component extraction was used, after which the number of factors was determined by both eigenvalues (>1) and the scree test.

Results

Age ranged from 3 years to 9 years with a mean of 15.34 (SD = 9.60; median = 13.0). Ratio of gender was 2:1, males/females, for both ASD children and Control group.

There were 20 males (67%) and 10 females (33%).

The comparison of means between ASD and Control for the RBS-R in the beginning of the study yielded significant difference between them for all subscales and full scales highlighting the substantial occurrence of repetitive behavior among ASD children compared to the controls. (Table 1).

Table 1. Comparison of Means between ASD and Control for the RBS-R in the beginning of the study

Subscale	ASD	Control	t	P
	Mean *(SD)*	Mean *(SD)*		
Stereotypic	7.8 *(6.4)*	2.1 *(3.3)*	-5.4	**<0.01**
Self-Injurious	4.8 *(7.5)*	0.7 *(2.1)*	-4.6	**<0.01**
Compulsive	9.5 *(8.2)*	2.6 *(4.7)*	-5.5	**<0.01**
Ritualistic	7.5 *(5.8)*	2.0 *(3.6)*	-8.5	**<0.01**
Sameness	14.9 *(9.2)*	2.5 *(5.3)*	-6.4	**<0.01**
Restricted Interests	6.3 *(4.7)*	1.5 *(2.7)*	-6.6	**<0.01**
Total score	50.8 *(41.8)*	11.4 *(21.6)*	-4.4	**<0.01**

Factor Analysis of the RBS-R

The rate of endorsement was calculated on the basis of dichotomous (present/not present) data, which were created by collapsing severity ratings 1 through 3. None of the items were eliminated; the frequency of endorsement ranged from 13.3% (item 13: "Inserts finger or object") to 66.7% (item 40: "videotapes"). Table 2.

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January – June 2022
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Exploratory factor analysis using the inter-item correlation matrix from the 43 items of the RBS-R. 12 eigenvalues were extracted accounting for 81.6% of the total variance.

5 eigenvalues were retained accounting for 59.3% of the total variance.

The number of factors to retain was guided by: (a) the scree plot method (b) eigenvalues above 1.0 (c) interpretability.

The extraction method was Principal Component Analysis.

The number of factors to retain was guided by: (a) the scree plot method (b) eigenvalues above 1.0, and (d) interpretability. Solutions between two and six-factors were evaluated using these criteria. Items were adopted as loading on a given factor if (a) they loaded 0.35 or higher on that factor. Examination of the factor solutions indicated that either a four-or five factor solution could be adopted.

The five-factor solution with promax rotation was chosen as most appropriate for this sample due to interpretable factors. In comparing this five-factor solution with original six subscales, the main difference is that the five-factor solution collapsed the original Ritualistic Behavior and Sameness Behavior subscales into one ("Ritualistic/Sameness") subscale.

Ritualistic Behavior means "performing activities of daily living in a similar matter," and Sameness Behavior means "resistance to change, insisting that things stay the same." It makes clinical sense that performing a ritual is strongly related to a need for sameness and consistency, as the present factor analysis indicates. Although the original Ritualistic Behavior subscale is oriented more towards activities and the Sameness Behavior subscale includes more references to specific objects, they share the construct of the need for invariance in both activities and in the environment.

Another important difference emerged by the present study in regard to Restricted Interests subscale. One of this subscale's four items did not load on one-factor, one item (item 41: Attached to object) resolved onto "Ritualistic/Sameness" subscale.

Given the small sample size the subscales encompass the minimum set of three items to consider loading on a factor. The subscales meet the minimum standards in terms of factorial structure.

The mean factor loadings for factors I through V were 0.71, 0.69, 0.66, 0.61 and 0.62, respectively.

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Volume 5, Issue 1

Table 2. Frequency of endorsement

	Frequency of endorsement	%
Stereotypy Subscale		
Body movements	25	41.7
Head movements	28	46.7
Finger movements	32	53.3
Locomotion	36	60.0
Object usage	21	35.0
Sensory	31	51.7
Self-Injurious Subscale		
Hits w/ body	17	28.3
Hits against surface	14	23.3
Hits w/ object	11	18.3
Bites self	17	28.3
Pulls hair/skin	9	15.0
Rubs/scratches	8	13.3
Inserts finger/object	8	13.3
Picks skin	14	23.3
Compulsive Subscale		
Ordering	38	63.3
Completeness	25	41.7
Washing	19	31.7
Checking	28	46.7
Counting	27	45.0
Hoarding	27	45.0
Repeating	26	43.3
Needs to touch/tap	17	28.3
Ritualistic Subscale		
Eating/mealtime	26	43.3
Sleeping/bedtime	25	41.7
Self care routine	31	51.7
Transportation routine	34	56.7
Play/leisure routine	28	46.7
Communication	31	51.7
Sameness Subscale		
Placement of objects	26	43.3
No new places	31	51.7
No interruption	31	51.7
Walks certain way	16	26.7
Sits certain place	11	18.3
Appearance/behavior of others	32	53.3
Uses certain door	22	36.7
Videotapes	40	66.7
Difficult transitions	32	53.3

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January – June 2022
Volume 5, Issue 1

Insists on routine	30	50.0
Insists on time	32	53.3
Restricted Subscale		
Preoccupation with subject	36	60.0
Attached to object	25	41.7
Preoccupied with part of object	25	41.7
Preoccupation with movement	34	56.7

Table 3. Five-factor principal components analysis

	Factors				
	1	2	3	4	5
Stereotypy Subscale					
Head movements			.596		
Finger movements			.757		
Object usage			.727		
Sensory			.595		
Self-Injurious Subscale					
Hits w/ body		.805			
Hits against surface		.722			
Hits w/ object		.707			
Rubs/scratches		.830			
Inserts finger/object		.392			
Compulsive Subscale					
Completeness					.484
Checking					.647
Hoarding					.626
Repeating					.588
Needs to touch/tap					.767
Ritualistic/ Sameness					
Sleeping/bedtime	.683				
Self care routine	.763				
Transportation routine	.763				
Play/leisure routine	.658				
Communication	.716				
Placement of objects	.728				
Appearance/behavior of others	.682				
Videotapes	.682				
Difficult transitions	.708				
Insists on routine	.812				
Insists on time	.695				
Restricted Subscale					
Preoccupied with part of object				.530	
Preoccupation with movement				.690	

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Item-total Correlations

Subscale scores were calculated by taking the integer weightings (0 –3) scored by the interviewer and totaling them for all items in the subscale. As a way of validating the five-factor structure, item-total correlations were calculated. Each of the remaining 27 items on the RBS-R was correlated with the subscale scores (item-deleted) of Ritualistic/Sameness Behavior, Self-injurious Behavior, Stereotypic Behavior, Compulsive Behavior, and Restricted Interests. All items correlated most highly with their hypothesized subscale (Table 3). The mean item-total correlation for Ritualistic/ Sameness Behavior was 0.74 (range from 0.64 to 0.84); for Self-injurious Behavior, 0.62 (range from 0.42 to 0.83); for Stereotypic Behavior, 0.63 (range from 0.53 to 0.80); for Compulsive Behavior, 0.69 (range from 0.45 to 0.85); and for Restricted Interests, 0.78 (range from 0.73 to 0.84). The RBS-R items are highly correlated to their own hypothesized subscales and moderately correlated to other subscales.

Internal Consistency

Cronbach's alpha was used to measure internal consistency, which is the extent to which an item is correlated with the remaining items from its subscale. The alpha values for the five subscales, listed in Table 4, ranged from 0.72 (Stereotypic) to 0.85 (Ritualistic/ Sameness Behavior). All values are within or above the acceptable range for research purposes.

Table 4: Internal Consistency and Item–scale correlation of RBS-R (n = 60)

Scale	Coefficient alpha	Item-scale correlation	P value (2-tailed)
Stereotypic	0.72	0.55 - 0.80	<0.01
Self-Injurious	0.81	0.42 – 0.83	<0.01
Compulsive	0.80	0.45 – 0.85	<0.01
Ritualistic / Sameness	0.85	0.64 – 0.84	<0.01
Restricted Interests	0.70	0.73 – 0.84	<0.01
Whole scale	0.92	----	

Reliability/stability over time

The analysis of responses between the test and the retest was conducted using Spearman non-parametric statistical test to compute the correlations between subscales of the first and second measurement. Correlation coefficients *(rho)* ranged from 0.94 – 0.99. The Wilcoxon non-parametric statistical test was used for the full scale to determine whether there were any significant differences between the responses at each time point: P value for ASD was 0.98 and for Control was 0.87.

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January – June 2022
Volume 5, Issue 1

The high correlation between the scores at the two time points along with non significant differences in the P values at the level of 0.05 in the responses to the items between the two tests indicates the instrument is stable over time.

Effects of Subject Characteristics on RBS-R Scores

In an effort to evaluate the effect of subject characteristics: (a) the age was split age (0 through 5 years, 6 through 9 years) (b) gender (male, female), for both ASD children and Control.

Gender. A trend ($p < 0.05$) for a gender effect was found on the stereotypic subscale, with males showing higher levels of occurrence than females. Table 5.

Age. There is no significant trend for age for the six subscales and for the total score.

Table 5. The efect of gender

Subscale	Male Mean *(SD)*	Female Mean *(SD)*	*t*	P
Stereotypic	9 *(6)*	5.4 *(6.1)*	-2.2	**0.04**
Self-Injurious	5.4 *(7.9)*	3.8 *(6.3)*	-1.4	0.2
Compulsive	8.7 *(8.3)*	11.2 *(7.7)*	1.2	0.2
Ritualistic	7.2 *(5.7)*	8.1 *(6.3)*	0.7	0.5
Sameness	13.5 *(9.4)*	15.9 *(8.3)*	0.7	0.5
Restricted Interests	6.3 *(4.8)*	6.4 *(4.7)*	0.1	0.9
Total score	50 *(42.1)*	50.8 *(39.4)*	0.06	0.9

Discussion

As far as could be determined, this is the first study in print to determine the subscale structure of the RBS-R through factor analysis in Albania. Although the results do not fully support Bodfish and colleagues' conceptually-derived six-subscale structure, the solutions are quite similar overall. The current study has a disadvantage of a relatively small sample size over Bodfish's principal components analysis. Hence, the five-factor solution is likely to be more stable and reproducible than the original six subscale approach, although this will need to be addressed through subsequent research.

The psychometric characteristics of the 5-subscale version of the RBS-R appear to be sound. The finding that the RBS-R can be used to differentiate various types of repetitive behaviors is an important step in the study of autism in Albania. Autism is a very complex, heterogeneous disorder, and the RBS-R may be particularly useful in identifying subgroups that may have prognostic or diagnostic utility. In addition, the RBS-R may be a useful tool in the assessment of treatment effects. The current

findings also suggest that the expression of RRB in autism may be modulated by a multitude of subject characteristics, and these relationships require further study. It is clear that repetitive behavior is highly correlated with the overall severity of autism, which provides further evidence for their clinical significance.

Although the study of repetitive behavior is in its infancy relative to the study of the social and communication domains in autism in Albania, the validation of the RBS-R provides an important step towards their future study.

Overall, the five-subscale, 27-item scoring method for the RBS-R appeared to have sound psychometric characteristics. The RBS-R may be a used in the assessment of treatment effects and the course of the illness.

Crohnbach's alphas for all of the subscales were satisfactorily high. However, the restricted interests factor is a weakness of this subscale and more research is needed in the future to avoid any kind of bias arising from small sample size and from the language of the questionnaire.

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January – June 2022
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