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Standard scores of the Repetitive Behavior Scale-Revised for people with autism and intellectual disability in Spain

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Introduction. Repetitive behavior is a transdiagnostic variable that is present in many neurodevelopmental disorders. The Repetitive Behavior Scale-Revised (RBS-R) by Bodfish is one of the tests most used to evaluate repetitive behaviors in people with autism and intellectual disability.

Materials and methods. In the present article, we analyze the differences in repetitive behavior according to the diagnosis, the interaction effects between diagnoses and gender and/or age and display the standard scores of the RBS-R for a group of people with autism, a group of people with intellectual disability and another group of people with Autism and intellectual disability.

Results. The results indicate that there are differences in the repetitive behavior between the groups, being greater the severity of the repetitive behaviors in people with autism associated to intellectual disability, followed by autism, and finally intellectual disability. Finally, the RBS-R percentiles according to diagnostic groups are shown.

Conclusions. The RBS-R has been shown to be a useful diagnostic tool for assessing some of the main neurodevelopmental disorders, such as autism spectrum disorders and intellectual disability.

Keywords: RBS-R, Standard scores, Repetitive behavior, Autism, Intellectual disability, Assessment

Actas Esp Psiquiatr 2019;47(6):209-17

Baremos de la Repetitive Behavior Scale-Revised para personas con autismo y discapacidad intelectual en España

Introducción. La conducta repetitiva es una variable transdiagnóstica que está presente en numerosos trastornos del neurodesarrollo. La *Repetitive Behavior Scale-Revised* (RBS-R) de Bodfish es una de las pruebas más empleadas para evaluar las conductas repetitivas en personas con autismo y discapacidad intelectual.

Metodología. En el presente artículo se analizan las diferencias en conducta repetitiva según el diagnóstico, las interacciones entre diagnósticos y sexo y edad, y se muestran los baremos del RBS-R para un grupo de personas con autismo, un grupo de personas con discapacidad intelectual y otro grupo de personas con autismo y discapacidad intelectual.

Resultados. Los resultados indican que hay diferencias en el comportamiento repetitivo entre los grupos, siendo mayor la severidad de las conductas repetitivas en las personas con autismo asociado a discapacidad intelectual, seguidas de aquellas con autismo y por último las personas con discapacidad intelectual. Por último, se muestran los percentiles de la escala RBS-R según grupos diagnósticos.

Conclusiones. La RBS-R ha mostrado ser una herramienta diagnóstica útil para valorar algunos de los principales trastornos del neurodesarrollo, tales como son los trastornos del espectro autista y la discapacidad intelectual.

Palabras clave: RBS-R, Baremos, Conducta repetitiva, Autismo, Discapacidad intelectual, Evaluación

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INTRODUCTION

Repetitive behaviours are activities or interests that occur regularly and interfere with a person's daily functioning. These behaviours manifest as repetitive motor phenomena such as stereotypies, circumscribed interests, compulsions, and serious behaviour problems[1]. In addition, repetitive behaviours include self-injurious behaviours; compulsive, ritualistic, and sameness behaviours; and restrictions[1].

Repetitive behaviour is a transdiagnostic variable that is present as a symptom in many neurodevelopmental disorders, such as intellectual disability (ID) and Autism Spectrum Disorder (ASD), in addition to other disorders such as obsessive-compulsive disorder (OCD), schizophrenia, Parkinson's disease, Sydenham's chorea, and Tourette syndrome[1-6].

Studies have indicated that the symptoms presented by people with ASD are associated with different neurological correlates. Thus, it has been shown that people with ASD present a decrease in brain activity in the frontal orbital area and the anterior cingulate cortex correlating with compulsive behaviours. Abnormalities have been found in subcortical structures such as the amygdala, hypothalamus, and basal ganglia structures that are associated with atypical emotional processing[7].

Therefore, repetitive behaviour can be considered a common variable in various mental disorders and is of great interest to the educational and scientific communities that investigate disability. In this sense, there is a relationship between the severity of repetitive behaviours and adaptation to the centre (e.g. specific and residential education) in people with ASD[8,9]. A recent study revealed that special education schools have students with greater severity of ASD symptoms and of repetitive behaviours, specifically stereotypic behaviours and self-injury, requiring higher levels of supervision and support in the classroom[8].

International studies have indicated the need to employ specific measures to determine the severity of repetitive behaviours in people with neurodevelopmental disorders[9,11,15-17]. The scale with the highest international recognition is the Repetitive Behavior Scale-Revised (RBS-R) by Bodfish et al.[1] The RBS-R has shown excellent psychometric properties in different countries[8,9,11-17] as well as in the Spanish population with ASD[18]. In addition, the RBS-R has been used to measure repetitive symptoms in populations with ID[1] and OCD[19]. Comparative studies indicate that there are no differences in repetitive behaviour in people with ASD according to sex and age[12,13,15,17,18]. However, people with ASD present significantly higher levels of severity for compulsive behaviours, stereotypies, and self-injury than people with ID[1]. Therefore, it seems that the diagnostic criteria that best distinguish the differential diagnosis between ASD and ID are restricted interests or repetitive behaviours[20]. Thus, at the diagnostic level, it is necessary to use scales that measure the severity of repetitive behaviour throughout its spectrum to be able to more adequately evaluate this symptomatology following the current DSM criteria. Recently, the psychometric properties of the RBS-R in the Spanish population with ASD have been described[18]. However, the scales of the RBS-R are not available for both people with ASD with and without ID and people with ID and without ASD in Spain. This task remains pending from the validation of this test and is useful for the medical and educational community.

Consequently, the present work has two objectives. First, it aims to examine the differences in repetitive behaviour according to the diagnosis of neurodevelopment and the possible differences according to sex and age. As with previous studies, it is expected that people with ASD and ID present a higher severity of repetitive behaviours than people with ID alone[1,18]. Similarly, it is expected that there will be no sex and age differences in repetitive behaviour among the three groups[12,13,15,17,18]. In the second part of our study, the scales of the RBS-R are provided for the three groups considered: 1) people diagnosed with ASD, 2) people with ID, and 3) people with ASD and ID.

METHOD

Participants

A causal or incidental sampling was used. Thus, participants from 18 centres in southeast Spain were included, specifically 13 from the autonomous community of the Region of Murcia and 5 from the province of Alicante (Valencian Community). Four centres were specifically special education schools, two were residences for people with ID, seven were day care centres, three were early intervention centres, and two were regular schools with open classrooms. The sample belonged to different-sized urban areas with representation from both rural and urban areas. All schools with support classes were mixed except for a private centre that was exclusively for boys. Half of the special education centres were public, and the other half were state-funded private schools. All residences and day care centres were managed by associations of persons with disabilities, which had an agreement with the public administration.

The inclusion criteria were based on the diagnostic characteristics of participants with ASD, ID (from mild to severe), and a combination of both according to DSM-5 criteria. The participants were previously diagnosed by the mental health services and institutions responsible for granting the certification of disability and dependence. Participants who presented other diagnoses such as motor dis-

Table 1 Characteristics of the sample according to the medication

Diagnostic groups		Medication: No	Medication: Yes	Total
ASD	n	59	26	85
	%	69.4%	30.6%	100%
ID	n	89	58	147
	%	60.5%	39.5%	100%
ASD-ID	n	89	67	156
	%	57.1%	42.9%	100%
Total	n	237	151	388
	%	61.1%	38.9%	100%

ASD: Autism Spectrum Disorder; ID: Intellectual disability; ASD-ID: Autism Spectrum Disorder and Intellectual disability

ability, multiple disabilities, attention deficit hyperactivity disorder, obsessive-compulsive spectrum disorders, neurodegenerative disease, and mental illness were excluded.

Finally, the total sample of this study was 388 participants aged between 3 and 70 years; 85 participants met diagnostic criteria for some type of ASD exclusively, 147 for ID alone, and 156 both diagnoses simultaneously (see Table 1). The results indicated statistically significant differences in the proportions by sex in each diagnostic group (χ^2=27.23; *gl*=2; *p*=.001) as well as the proportions by age group (χ^2= 73.31; *gl*=6; *p*=.001). However, the *phi coefficients* were .26 and .43, and the *Cramer Vs* were .26 and .31, respectively, indicating low effect sizes or low ratio. The age groups were established according to the criteria by Lam and Aman[15].

INSTRUMENTS

Sociodemographic questionnaire

This instrument was prepared ad-hoc and adapted from the original version[15]. It consists of a series of sociodemographic questions: age, sex, country of birth, type of educational context (e.g. day care centre, within early care, etc.), and diagnosis where the type of education is evaluated: ASD (Autism, Asperger's Syndrome, etc.), severity of ID according to diagnostic criteria DSM-5[21], and severity of ASD symptoms based on a Likert scale of 0 to 4 (nothing, light, moderate and severe). Finally, the instrument includes a dichotomous response question about the current pharmacological treatment ("Is this person/Are you currently taking any medication?") and the option to indicate the medicine.

Repetitive Behavior Scale-Revised (RBS-R)

The RBS-R evaluates repetitive behaviours through 43 items grouped into six different dimensions of repetitive behaviour in people with ASD and/or disability. These factors are stereotypic, self-injurious, compulsive, ritualistic, sameness, and restrictive behaviour[1]. The items are classified on a 4-point Likert scale from 0, which refers to a repetitive behaviour that does not occur, to 3, indicating a very serious repetitive behaviour. The assessment of repetitive behaviour is based on observations and interactions during the last month by a relative, caregiver, or professional who knows the person well. The RBS-R has excellent psychometric properties, a structure of six factors, adequate reliability, and concurrent–divergent validity in different countries, such as the USA, Canada, Greece, Japan, Italy, and Spain.[8,12-15,17,18,22]

Procedure

The study was approved by the Ethics Committee of the University of Alicante (Spain) and the Consejería de Educación y Universidades of Murcia (Spain). We obtained written informed consent from parents and caregivers of schools, day care centres, early care centres, and residences.

The tests were completed by educational professionals who had more knowledge about the behaviour of people with ID and autism in the centre (psycho-pedagogues, special education teachers, and psychologists). The first section of the "Sociodemographic Questionnaire" protocol developed ad-hoc[15] was completed only by expert psychologists who had relevant information about the diagnosis of the participants, who were previously diagnosed by the corresponding health centre following APA criteria[19]. On the other hand, the RBS-R scale was completed by professionals from the centres that had the most daily contact with the person. All the participating centres had a training session organized by the researchers to explain the purpose of the research, the tests used, and the instructions on how to perform the tests.

Analysis of data

The relationships between repetitive behaviours and diagnostic groups were analysed first with a MANOVA to examine the effects of interaction between the variables under study. Subsequently, ANOVAs and post-hoc comparisons were used with the Scheffé method in which the statistically significant relationships are p<.005. First,

comparisons were made between the age and sex groups within each of the groups according to diagnosis. The differences with p < .05 were considered significant. To determine if there were statistically significant differences between the proportions found, the corresponding size of the effect was calculated. To do this, *eta-squared* (η^2) was calculated using the following categorization[21]: no effect ($0 \leq \eta^2 \leq .009$), small effect ($.01 \leq \eta^2 \leq .089$), intermediate effect ($.09 \leq \eta^2 \leq .249$), and large effect (from .25). Similarly, the magnitude of the differences among the three groups was calculated where $.20 \leq d \leq .50$ assumes a low effect size, $.51 \leq d \leq .79$ is moderate, and $d \geq .80$ is high[24,25]. Finally, the scales of the sample of participants with ASD and ID were found by calculating the percentile scores. *IBM SPSS-Statistics 22* for Windows was used in all statistical calculations[26].

RESULTS

Repetitive behaviour according to diagnosis based on sex and age

The MANOVA results indicate that there is no interaction effect between the diagnostic groups and the variable sex in the repetitive behaviours of the RBS-R (Lambda Wilks =.97, F (6, 12)=.84, p=.61) or between the diagnostic and age groups in the repetitive behaviours of the RBS-R (Lambda Wilks =.88, F (6, 36)=1.390, p=.06). There was also no interaction between the diagnostic groups and the medication (Lambda Wilks =.97, F (6, 12)=1.075, p=.38). Finally, we also conducted an analysis to examine the interaction of diagnostic groups with sex, age, and medication (Lambda Wilks =.97, F (6, 18)=959.322, p=.96). In this way, differences in repetitive and stereotypic behaviours could be analysed according to diagnostic category without distinction according to sex, age, or drug use.

Repetitive behaviour according to diagnosis

The MANOVA results indicate that there is an interaction effect between the diagnostic groups and the repetitive behaviours (Lambda Wilks =.77, F (6, 12)=9.05, p=.001).

The ANOVAS indicate differences between the diagnostic groups in all subscales of the RBS-R: stereotypic (F (2, 387)=37.84, p=.001), self-injurious (F (2, 387)=8.86, p=.001), compulsive (F (2, 387)=9.49, p=.001), ritualistic (F (2, 387)=18.55, p=.001), sameness (F (2, 387)=17.20, p=.001) and restricted (F (2, 387)=12.94, p=.001). The ANOVA with the total score also indicated statistically significant differences (F (2, 387)=25.37; p=.001).

In addition, no interaction effect was found between the groups of people with ASD and the severity of the ASD symptoms for repetitive behaviours (Lambda Wilks =.92, F (6, 18)=1.63, p=.05), among the groups of people with ID according to the severity of ID for repetitive behaviours (Lambda Wilks =.95, F (6, 18)=1.03, p=.42), or among the

Table 2 Characteristics of the sample according to diagnosis

	ASD	ID	ASD-ID	
	n (%)	n (%)	n (%)	N (Total)
Women	15 (17.6)	71 (48.3)	42 (26.9)	128 (33)
Man	70 (82.4)	76 (51.7)	114 (73.1)	260 (67)
Age				
0 to 6 years	10 (11.8)	11 (7.5)	39 (25)	60 (15.5)
7 to 11 years	47 (55.3)	26 (17.7)	44 (28.2)	117 (30.2)
12 to 17 years	20 (23.5)	34 (23.1)	28 (17.9)	82 (21.1)
From 18 onwards	8 (9.4)	76 (51.7)	45 (28.8)	129 (33.2)

ASD: Autism Spectrum Disorder; ID: Intellectual disability; ASD-ID: Autism Spectrum Disorder and Intellectual disability

Table 3 Differences in repetitive behavior according to diagnosis

RBS-R Behavior	ASD	ID	ASD-ID			
	M(SD)	M(SD)	M(SD)	$F_{2,388}$	p	η^2
Stereotypic	1.72 (2.53)	1.12 (2.22)	4.26 (4.32)	37.84	0.001	0.16
Self-injurious	0.95 (2.23)	1.09 (2.53)	2.37 (3.80)	8.86	0.001	0.04
Compulsive	2.18 (2.51)	1.14 (2.21)	2.41 (3.00)	9.48	0.001	0.05
Ritualistic	3.41 (3.41)	1.42 (2.38)	3.39 (3.48)	18.55	0.001	0.09
Sameness	4.50 (5.02)	1.84 (2.95)	4.91 (5.92)	17.19	0.001	0.08
Restricted	1.93 (2.31)	0.80 (1.72)	1.87 (2.43)	12.93	0.001	0.06
Total RBS-R	14.76 (14.81)	7.42 (10.03)	19.23 (17.37)	25.36	0.001	0.12

RBS-R: Repetitive Behavior Scale-Revised; ASD: Autism Spectrum Disorder; ID: Intellectual disability; ASD-ID: Autism Spectrum Disorder and Intellectual disability

groups of people with ASD and ID according to the severity of ID and the symptoms of ASD for repetitive behaviours (Lambda Wilks =.968, F (6, 6)=1.97, p=.07).

Table 3 shows the average scores and standard deviations in the different subscales of the RBS-R obtained by the groups of people with ASD, ID, and both ASD and ID (ASD-ID). In all cases, the differences in the scores on the RBS-R dimensions were significant with medium effect sizes for stereotypic, ritualistic behaviour and total RBS-R while the effect size was small for the rest of the subscales. Thus, Scheffé's analysis indicates that the group of people diagnosed with ASD-ID presented significantly higher scores in stereotypic (p=.001; d=.90), self-injurious (p=.002; d=.39), compulsive (p=.001; d=.39), ritualistic (p=.001; d=.65), sameness (p=.001; d=.65), and restricted (p=.001; d=.50) behaviour and in total RBS-R (p=.001; d=.82) compared to the group of people with ID. Likewise, the group of people with ASD-ID presented significantly higher scores in stereotypic (p=.001; d=.67) and self-injurious behaviour (p=.003; d=.42) compared with the group of people with ASD but without ID. The group of people with ASD present significantly higher scores in compulsive (p=.01; d=.44), ritualistic (p=.001; d=.71), sameness (p=.001; d=.69), and restricted behaviour (p=.001; d=.57) and in total RBS-R (p=.001; d=.61) than the group of people with ID.

Standard scores of the RBS-R

Tables 4, 5, and 6 show the direct and percentile scores of the groups of people with ASD, people with ID, and people with ASD-ID.

DISCUSSION

The present study aimed to examine the frequencies of repetitive and stereotypic behaviours and to obtain, for the first time in Spain, the scales of the RBS-R scale in people with ASD-ID, ASD, and ID.

Initially, from the analysis of sociodemographic variables, we can draw several conclusions. The sample used in this study was similar to that used by previous studies that included similar sample sizes of between 200 and 300 people with ASD and ID[13,15,17,18]. Like previous studies of psychometric validation of the RBS-R, the sample of the present study included all ages of the evolutionary period from childhood to adulthood[6,10,11,13,16,20]. Regarding the sex variable, the descriptive results indicate a higher percentage of men with a diagnosis of ASD (82.4%) and of ASD together with ID (73.1%) while the group with only ID was almost homogeneously distributed. These data are expected given the higher prevalence of male patients in the diagnosis of ASD and the more equitable distribution in ID[21]. Regarding age, there is a greater number of children and adolescents in the group

Table 4 RBS-R percentages for the sample of people with intellectual disabilities

Percentile	Stereotypic	Self-injurious	Compulsive	Ritualistic	Sameness	Restricted	Total
1	0	0	0	0	0	0	0
5	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-
30	-	-	-	-	-	-	1
35	-	-	-	-	-	-	1
40	-	-	-	-	-	-	2
45	-	-	-	-	-	-	2
50	-	-	-	-	-	-	3
55	-	-	-	-	1	-	4
60	-	-	-	1	1	-	5
65	-	-	-	1	1	-	7
70	1	-	1	2	2	-	10
75	1	1	2	2	3	1	12
80	2	2	2	3	3	1	13
85	4	2	3	3	5	2	15
90	4	4	4	5	6	3	25
95	7	8	6	7	8	5	32
99	11	14	11	12	13	9	46

with ASD (90.6%), a distribution close to 50:50 for children and adolescents compared to adults with ID, and around 72% of children and adolescent for the group ASD-ID, although the age groups of ASD-ID were more balanced (percentages between 17.9% and 28.8%). As in previous studies, the present study showed no differences in repetitive behaviours depending on the sex variable[12,13,15,17,18]. In the same way, regarding the differences according to the age variable, the results are similar to previous studies that found no differences in repetitive behaviour or interaction effects[13,15,17,18]. However, in line with previous studies, the results of our study suggest that there are differences in the repetitive behaviour between diagnostic groups[1,20]. Specifically, the severity of repetitive behaviour is greater in people with ASD and people with ASD who also have ID. Therefore, repetitive behaviour is a determining variable to perform the differential diagnosis between ASD and ID[20]. However, repetitive behaviour is not specific to autism[5-7], and, therefore, the RBS-R scale can be used as a transdiagnostic assessment instrument for other neurodevelopmental disorders.

Table 5 RBS-R percentages for the sample of people with ASD

Percentile	Stereotypic	Self-injurious	Compulsive	Ritualistic	Sameness	Restricted	Total
1	0	0	0	0	0	0	0
5	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-
15	-	-	-	-	-	-	1
20	-	-	-	-	-	-	2
25	-	-	-	1	1	-	3
30	-	-	-	1	1	1	4
35	-	-	1	1	2	1	7
40	-	-	1	2	2	1	8
45	-	-	1	2	2	1	8
50	-	-	1	3	3	1	9
55	1	-	2	3	3	2	11
60	1	-	2	3	4	2	13
65	2	-	3	4	4	2	14
70	2	-	3	4	5	3	18
75	3	1	3	5	7	3	21
80	4	1	4	6	9	4	27
85	5	2	5	7	11	4	30
90	6	4	5	8	11	6	38
95	8	7	9	11	15	6	49

The results of this study provide for the first time the scales of correction of the RBS-R scale for its use in the Spanish population with a diagnosis of ASD with or without ID and people with ID.

It should be noted that the study has some shortcomings that limit the generalization of the results. The convenience sampling does not guarantee the representativeness of the sample, although the use of multiple centres, two autonomous communities, and those belonging to different educational levels allow us to consider this sample as representative of people with autism, ID, or both disorders. simultaneously. Another limitation of the study is the use of a single hetero-informed test to evaluate the repetitive and stereotyped behaviours of the participants, although it is one of the most used, and the informants are those who know best how they work. Finally, it would have been desirable to specify the class of drug and the dose in this study. Future studies should analyze in greater depth the interactions between the severity of repetitive behaviour and the type and dosage of drugs used.

It is concluded that this is an instrument that can be very useful both for psychiatry, pediatrics, psychology, and the educational community, specifically in the guidance teams of the autonomous communities to improve the di-

Table 6 Percentiles of the RBS-R for the sample of people with ASD and intellectual disability

Percentile	Stereotypic	Self-injurious	Compulsive	Ritualistic	Sameness	Restricted	Total
1	0	0	0	0	0	0	0
5	-	-	-	-	-	-	-
10	-	-	-	-	-	-	2
15	-	-	-	-	-	-	4
20	-	-	-	-	-	-	5
25	-	-	-	1	-	-	6
30	1	-	-	1	-	-	7
35	2	-	-	1	1	-	9
40	2	-	1	2	1	-	10
45	3	-	1	2	2	-	12
50	3	1	2	2	3	1	13
55	4	1	2	2	3	1	16
60	4	1	2	3	4	2	18
65	5	2	2	4	5	2	20
70	6	3	3	5	7	2	24
75	7	3	4	6	8	3	30
80	9	4	5	6	10	4	35
85	9	6	5	7	11	4	39
90	10	8	7	8	14	6	46
95	13	12	9	11	18	7	55
99	18	18	14	13	26	10	84

agnosis of ASD and the severity of symptoms related to repetitive behaviour.

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