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TRANSLATION, ADAPTATION AND VALIDATION OF THE EXECUTIVE FUNCTIONING INVENTORY ON PAKISTANI AUTISTIC ADOLESCENTS: EXPLORATORY FACTOR ANALYSIS

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Abstract
The current study was conducted to translate, adapt and cross-culturally validate the Executive Functioning Inventory (EFI). The current Study was performed on a sample of 210 autistic adolescents. Parents and special education teachers filled out the questionnaires. Sample of the current study was collected from twin cities by using purposive sampling technique. Ethical standards given by APA were maintained throughout the study. All statistical procedures, including item total correlation, Pearson product-moment correlation between Urdu and English versions of EFI, and exploratory factor analysis yielded positive results. EFA confirmed the 6 factors as suggested by the authors and some changes were suggested by subject matter experts after factor loading for for the use of EFI on Pakistani autistic population. Item no 39 was excluded based on its factor loading and item no 38 was moved to Risk Avoidance subscale while item no 13 was moved to Emotional Regulation subscale. Our study translated and adapted EFI in Pakistani culture and open the door for cross-cultural comparisons for EFI in future.We translated, adapted and validated the executive functioning inventory for the Pakistani autistic adolescents. This study will be very helpful to promote inclusion in our society. Our society needs these types of culturally validated measures for the special needs persons which can accurately assess their executive and cognitive functioning and provide them the ideal environment according to their special needs.
Keywords: Autism, Adolescents, Executive Functioning Inventory, Validation

INTRODUCTION:

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental disorder that is characterized by persistent deficits in social communication and interaction, as well as restricted and repetitive patterns of behavior, interests, or activities. It is a lifelong condition that typically appears during early childhood, although it may be diagnosed later in some cases (American Psychiatric Association, 2013).

Executive functioning refers to skills related to planning, working memory, emotional control and inhibition (Kalbfleisch&Loughan, 2012). Any change in life disturbed executive functioning of typically growing children and its negative impacts on the executive functioning of children with autism are beyond imagination. Transition intervene the executive functioning skills of even high functioning autistic children and it is thought that IQ deficiencies of autistic children is the main predictor of poor performance of autistic children on tasks requiring high level of executive skills (Kalbfleisch&Loughan, 2012). Previous research studies has indicated that executive functioning of autistic adolescents are not up to the mark and that is why they face a lot of issues in their life due to their poor executive skills (Hendricks, 2010).

We also know that Autism affects individuals across various domains, including social communication, sensory processing, executive functioning, and adaptive skills. Difficulties in social interaction may manifest as challenges in understanding and using non verbal mmunication cues, difficulties in developing and maintaining relationships, and a preference for solitary activities. Sensory sensitivities are also common, with individuals experiencing heightened or decreased sensitivity to sensorys timulisuch assound, touch, orlight. Executive functioning challenge scan affect planning, organization, problem-solving, and flexible thinking. Adaptive skills, including self- care, independence, and daily living skills, may also be impacted (Lord et al., 2018; Dawson, et al., 2010).

For adolescents with autism it is quite difficult to secure admission and complete course from the college due to their intellectual, behavioral and psychological issues. Previous literature also suggest that symptoms and co-morbidity of autism created many issues for ASD adolescents in higher educational settings (Bolourian, Stavropoulos &Blacher, 2019; Mandy et al., 2019). ASD students can perform well in special education settings but their inclusion into mainstream is highly difficult due to their limited social and personal care skills (Knott & Taylor, 2014).

Although there are few other measures available for assessing executive functioning skills in austitic adolescents but we found Executive Functioning Scale (EFS) developed by Uljarevic et al., 2023 most suitable for being used in Pakistani culture. It is a recent measure and it needs to be translated, adapted and validated into our culture for its convenient use.

Objectives of the study:

1. To translate and modify Executive Functioning Scale.
2. To establish the psychometric properties of Executive Functioning Scale.
3. To establish the factorial validation of the Executive Functioning Scale.

Translation Process:

Before translating scales into Urdu language, formal permissions from the authors/developers of the scales were taken. Scales were translated by using *Brislin's classic backward and forward model* (1970, 1986). *Brislin's classic model* (1970, 1986) model consist of following steps;

Step 1: Forward Translation
Step 2: Committee Approach
Step 3: Back Translation
Step 4: Committee Approach
Step 5: Try Out

During forward translation English version of EFI were translated into Urdu by using guidelines provided by Brislin (1976). Five independent bilingual experts including 1 clinical psychologist, 2 assistant professor, 2 Master degree holders in Urdu language participated in this phase. Five independent translations of scales were obtained after the completion of this phase. Five independent translations obtained by bilingual experts were presented in a committee approach. This committee consisted of 5 subject matter experts. Items that, they perceived as very close to original versions of the scales were finalized and selected for the back translations. After committee approach, the back transition of the previously finalized Urdu versions was done into the English language with the aim to maintain and regulate the authenticity of the Urdu translated versions. At the end of this phase 5 independent English versions of scales were obtained. After that committee approach was again used to for the finalization of English versions of scales, which were produced during 3rd phase of the translation process. As EFI have been developed for autistic adolescents so cultural sensitivity and cultural adherence was kept in mind through the process of translation. Cross language validation process was performed at the last phase of EFI translation and adaptation.

Instruments of the study

Consent form

Consent from the participants about their voluntary participation was taken. Participants were informed about the scope and nature of the study. They were assured that information they will provide will be used only for the research purpose and it will be kept highly confidential.

Demographic data sheet

Demographic data sheet was designed to collect basic information about the study participants. Information about participants' name (optional), age, gender, education and category of Autism were gathered by using demographic sheet.

Executive Functioning Scale (EFS; Uljarevic et al., 2023):

The Executive Functioning Scale (EFS) developed by Uljarevic et al., 2023 is a most recent scale with 52 items. This scale was developed to measure the executive functioning capabilities of children with autism spectrum disorders and with other neurodevelopmental disabilities. EFS has 6 subscales including Sequencing / Working Memory, Processing Speed, Risk Avoidance, Set Shifting, Response Inhibition and Emotion Regulation. It is scored on a 5-point Likert scale including 0=never, 1=rarely, 2=sometimes, 3=often and 4=very often. The Executive Functioning Scale was filled by parents. The Executive Functioning Scale is psychometrically very sound.

In the current study the Executive Functioning Scale was translated and adapted on the sample of 210 ASD adolescents.

Sample: Sample of the current study includes autistic adolescents. For pilot study sample contained 30 autistic adolescents and for main study sample consisted of 210 autistic adolescents. Their age ranges from 13 to 18. TRS was filled by their parents and teachers. Sample was collected by using purposive sampling method. Sample was taken from public and private special need institutes.

Procedure:

EFI was given to teachers and parents of the autistic adolescents. Only those teachers were given EFI who were in active contact since last 2 years. Ethical standards given by APA were adhered at every step of the current study.

Data Analysis

Quantitative data analysis was be done by Statistical Package for social sciences SPSS version 27.

Table 1 Means and standard deviation, Pearson product correlation between Urdu and English versions of EFI (n=30)

Variable	M	SD	alpha	R
EFI English	33.5	2.05	.76	.92***
EFI Urdu	35.1	2.00	.78	

Note: EFI= Executive Functioning Inventory, ***P<.001
Above table shows Means and standard deviation, Pearson product correlation between Urdu and English versions of EFI (n=30). Both English and Urdu versions of EFI are highly statistically positively correlated with each other.

Table 2 Socio-demographic profiling of the study participants (n=210)

Variables	***Categories***	***F***	***%***
Gender	Girls	91	43
	Boys	119	57
Age	13-15	63	30
	16-18	147	70
Education	Primary	168	80
	Secondary	42	20
Level of Diagnosis	ASD Level 1	140	67
	ASD Level 2	49	23
	ASD Level 3	21	10
Early Interventions	Yes	98	47
	No	112	53

Table 1 shows the demographic analysis of sample.

Table 3 Item total correlation of Executive Functioning Inventory (EFI) of study participants (n=210).

Items	**R**
EFI_1	.76
EFI_2	.60
EFI_3	.84
EFI_4	.59
EFI_5	.68
EFI_6	.79
EFI_7	.50
EFI_8	.76
EFI_9	.80
EFI_10	.81
EFI_11	.78
EFI_12	.68
EFI_13	.60
EFI_14	.59
EFI_15	.63
EFI_16	.76
EFI_17	.69
EFI_18	.84
EFI_19	.79
EFI_20	.81
EFI_21	.63
EFI_22	.78
EFI_23	.71
EFI_24	.69
EFI_25	.65
EFI_26	.76
EFI_27	.74
EFI_28	.54
EFI_29	.79
EFI_30	.49
EFI_31	.74
EFI_32	.75
EFI_33	.69

EFI_34	.68
EFI_35	.75
EFI_36	.68
EFI_37	.74
EFI_38	.82
EFI_39	.80
EFI_40	.74
EFI_41	.73
EF1_42	.70
EFI_43	.65
EFI_44	.78
EFI_45	.65
EFI_46	.80
EFI_47	.71
EFI_48	.70
EFI_49	.76
EFI_50	.59
EFI_51	.48
EFI_52	.66

Note: EFI= Executive Functioning Inventory

Above table shows the values of item-total correlation for the measure of EFI= Executive Functioning Inventory. Findings of the above table shows that all values of item-total correlation are in the acceptable range of .50 to .80

Table 4 Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlettt Test of Sphericity of EFI (n=210).

Kaiser-Meyer-Olkin Measure	**Bartlettt Test of Sphericity**	**df**	**P**
.89	1049	1326	.000

Note. df=degree of freedom

***p<.001

Above table shows Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlettt Test of Sphericity of EFI (n=210). Value of KMO was .89 which suggests sample was commendable to perform EFA (Kaiser, 1974).

Table 5 Factor loading for EFI scale through principal axis factoring by using Promax (n=210).

				EFA values			
Nos	**Items**	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**	**Factors 6**
1	EFI_1	.67					
2	EFI_2	.74					
3	EFI_3	.76					
4	EFI_4	.64					
5	EFI_5	.71					
6	EFI_6	.61					
7	EFI_7	.80					
8	EFI_42	.57					
9	EFI_43	.62					
10	EFI_44	.58					
11	EFI_45	.73					
12	EFI_46	.78					
13	EFI_8		.46				
14	EFI_9		.40				
15	EFI_10		.63				
16	EFI_11		.41				
17	EFI_12		.57				
18	EFI_38		.76				
19	EFI_21		.59				
20	EFI_29			.70			
21	EFI_30			.75			
22	EFI_31			.71			
23	EFI_32			.47			

24	EFI_33			.65			
25	EFI_40			.81			
26	EFI_41			.70			
27	EFI_13				.80		
28	EFI_14				.47		
29	EFI_15				.52		
30	EFI_16				.58		
31	EFI_17				.69		
32	EFI_18				.58		
33	EFI_19				.53		
34	EFI_20				.50		
35	EFI_22				.64		
36	EFI_23				.81		
37	EFI_24				.82		
38	EFI_34					.71	
39	EFI_35					.80	
40	EFI_36					.67	
41	EFI_37					.61	
42	EFI_47					.75	
43	EFI_48					.52	
44	EFI_49					.60	
45	EFI_50					.57	
46	EFI_51					.65	
47	EFI_52					.59	
48	EFI_25						.60
49	EFI_26						.59
50	EFI_27						.58
51	EFI_28						.59

Note: Factor leading > .30, EFA= Exploratory Factor Analysis, EFI= Executive Functioning Inventory.
Above table shows factor loading for EFI scale through prinicipal axis factoring by using Promax (n=210). All items of EFI (Except Item 39) were loaded into six factors.

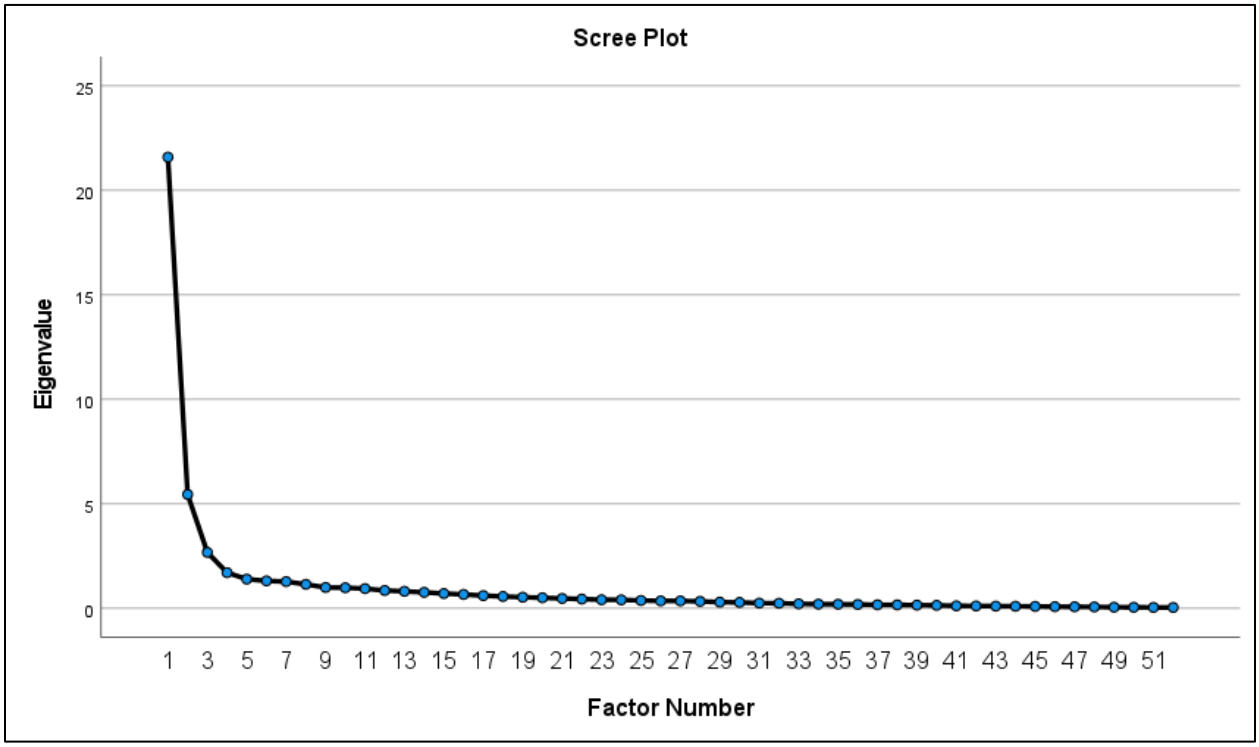
Factors	**Items**
Factor 1 (Sequencing / Working Memory)	1-7, 42-46
Factor 2 (Risk Avoidance)	8-12, 21, 38
Factor 3 (Response Inhibition)	29-33, 40-41
Factor 4 (Emotion Regulation)	13-20, 22-24
Factor 5 (Set Shifting)	34-37, 47-52
Factor 6 (Processing Speed)	25-28
Total EFI	All items (Sum of 51 items)

Item no 39 was excluded due to its poor factor loading (<.01). Item no 38 was moved to RAS because it loaded in RAS while it was previously loaded in RIS. Item no 13 was moved to ERS due to its high loading into ERS. These decisions were made after expert opinion.

Table6 Pearson Product Moment Correlation among Factors obtained by Promax Rotation (n=210).

Factors	**1**	**2**	**3**	**4**	**5**	**6**
F1	-	.56**	.78**	.80***	.58*	.68**
F2	-	-	.71**	.73**	.78**	.65**
F3	-	-	-	.63*	.69**	.60*
F4	-	-	-	-	.59*	.72**
F5	-	-	-	-	-	.80***
F6	-	-	-	-	-	-

Note: F=Factors
***p<.001
Above table shows Pearson Product Moment Correlation among Factors obtained by Promax Rotation (n=210). All factors are positively and significantly correlated which make grounds to use oblique rotation strong.
Scree Plot of EFI:



DISCUSSION:

Current study was performed to translate and validate EFI on our indigenous culture. No prior study translated and validated the EFI in Pakistani culture and no one even explore its factor structure in Asian cultures. There was high need to translate and adapt EFI in our culture because due to lack of education and language barriers it was not easy to understand items of EFI for the parents of autistic adolescents. For making it theoretically sound and more reliable in our indigenous culture we translated, adapted and validated EFI.

Demographic analysis of the data shows that 91(43%) girls and 119(57%) boys participated in the current study. 63(30%) of the sample falls into the age category of 13-15 years and 147(70%) were from age range of 15-18. 168 (80%) were from primary classes and 42(20%) were from secondary classes. 140 (67%) among them were having ASD level 1, 49(23%) were having ASD level 2 and 21(10%) were having ASD level 3. Among all only 98 (47%) had early interventions and rest of all 112(53%) did not have any early intervention.

During exploratory factor analysis, several changes were made based on the factor loading in our indigenous sample. Item no 39 (Can resist immediate desires because they are not good over the long-term) was excluded because it did not load in any factor. Item no 38 (Considers consequences before acting) was moved into Risk Avoidance subscale of EFI and item no 13 (Makes good decisions in dangerous situations) was moved into Emotion Regulation Subscale. All these decisions was made on the bases of factor loadings and subject matter experts.

Inner item correlations (r=.91***) between English and Urdu versions of EFI suggest no issue in Urdu translation. Inner item correlations for Urdu version of EFI were also positive and strong (See table 2). Overall it is concluded that EFI is a good scale for use with Pakistani autistic adolescents. It is psychometrically sound and yields accurate results.

Limitations of the Current study:

Next level studies can be conducted while using larger and more diverse sample. Maximum efforts should be done to avoid biasness in the translation and adaption process. Next level studies should also perform confirmatory factor analysis in Pakistani Culture to explore its underlying concepts for our indigenous data.

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