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Research Paper

Executive Function Rating Scale [EFRS]: A Study among Learning Disabled. Tool development: Item Generation and Item Analysis

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ABSTRACT

This study is developing a tool, Executive Function Rating Scale [EFRS], to assess the executive functions (EF) of the learning disabled (LD) students. Many studies have found that learning disabled students have problems in executive functions. But there is no standardized tool to asses EF of LD students. The study was conducted on 30 LD students (N=30), aged 10 to 15 years. 11 dimensions were selected and 100 items were generated by the researcher. Two focus group discussions and one expert review were conducted and 29 items were deleted. After data collection, Item Analysis, Facility Index (FI) and Discrimination Index (DI), (Item Total correlation and Total item correlation) were done. Items with FI value > 0.75, (one item), was deleted. The items with DI value < 0.30 were deleted. The final 15 items were selected for further standardization process.

Keywords: *Executive Functions, Learning Disability, Item analysis, Facility index, Discrimination index,*

The understanding and significance of the term Executive Function (EF) has increased over past 2 decades. There are many definitions for executive functions. But the widely accepted definition of EF is "an all- encompassing construct or an umbrella term for complex cognitive processes that underlie flexible, goal- directed behaviour" (*Andreson 2002*). EF include the cognitive abilities such as planning and organizing, attention and emotional regulation, inhibition and initiation, goal setting, flexibility, working memory, self-monitoring and self - regulatory process (*Goldstien, Naglieri, 2014*). A study conducted by *Garon, Bryson, and Smith* (*2008*) suggest that the elementary forms of core EF components are present early during the preschool period.

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EF continues to develop through adolescence and some of the components like planning, working memory, complex problem solving demonstrate maturation in adolescence (*Asto, Sweeny and Luna, 2004)*. If there is delay or impaired development in EF, it would lead to problems in smooth functioning of activities and inability to focus, plan and complete the task on time. The child would face problems in leaning as the EF components aid learning and are inevitable. This might also lead to learning disability among children. Learning Disability or SLD is a neurodevelopment disorder that impedes the ability to learn or use specific academic skills (e.g., reading, writing, or arithmetic), which are the foundation for other academic learning (*DSM V, 2013*).

Impaired development of components of EF can cause difficulty in reading, writing, and arithmetic. All these areas require planning, organizing and working memory. One child would fail to perform any of the tasks and complete it successfully. Another study suggested that children with SLD, have problems in processing speed, which indirectly falls in EF spectrum (*Lynn Meltzer, 2018*). These deficits might also lead to difficulties in academic performance in schools.

Impaired EF would also impede development of automaticity in children (*Lynn Meltzer, 2018*). Automaticity is developed with repetitive learning, attention, working memory, organizing, all of which are components of EF. And reduced automaticity would affect their reading fluency and arithmetic. Enhancing these components may help the students to improve their academic performance. Even though this concept is highly studied, only few efforts were taken to develop a standardized tool to assess the Executive Function of Learrning Disabled students. 11 dimensions were selected on the basis of various works on executive functions. The dimensions selected for the study are planning, organizing, attention, short term memory, decision making, problem solving, initiation, multi-tasking, continuity, shifting, self-regulation (*Asto, Sweeny and Luna, 2004, Stuss 2010,).*All these factors play very important role in academic performance of a student. Leaning disabled students face problems in these areas. They find it difficult to focus on one task and complete it on a given time. A study conducted by *Busch, McBride, Curtiss, & Vanderploeg, 2005* which shows that the executive function plays an important role in tasks that are fluid in nature such as new problem solving and adapting to the situations.

A rating scale was developed by Gerard, Gioia, Peter. Steven, and Lauren Kenworthy; BRIEF, Behaviour Rating Inventory of Executive Functions. Assess executive function behaviors in the school and home environments with the BRIEF, a questionnaire developed for parents and teachers of school-age children. Designed to assess the abilities of a broad range of children and adolescents, the BRIEF is useful when working with children who have learning disabilities and attention disorders, traumatic brain injuries, lead exposure, pervasive developmental disorders, depression, and other developmental, neurological, psychiatric, and medical conditions.

Very few tools are available to assess the EF of LD students. So this study is an attempt to develop a standardized tool for assessment. Only a proper assessment would aid to

understand the underlying cause of the problem or difficulty. Knowledge about the problem would help in adopting appropriate method or technique to enhance the abilities and improve their performance.

Main aim of this study is to develop a tool to assess executive functions of learning disabled. This study focuses on the primary phase of tool development, item generation and item analysis.

METHOD

Participants:

The participants of this study are 30 LD students (N=30) aged between 10 to 15 years. Mean age is 12.6 years. 12 samples were selected from Kerala and 18 samples were selected from Tamil Nadu. Only students who are receiving training in special schools were selected for this study. Children with all types of learning disability were selected for this study.

Sampling technique:

Purposive sampling.

Steps in tool development:

1. **Item generation:**
   After analysing the existing tool and literature, the researcher selected 11 dimension and 100 items were generated. The literature and other similar tools were thoroughly studied and analysed, which gave an outline of the dimensions and the type of items suitable and appropriate to assess the dimensions.
2. **Focus group discussion I:**
   The researcher and a group of 4 people (research scholars) analyzed the 100 statements generated by the researcher.
   15 items were modified after the focus group discussion.
3. **Expert review:**
   The questionnaire was given to 4 experts (teachers). It helps to get feedback about every statements and about the dimensions selected by the researcher. After their evaluations, the researcher compiled the feedback for each statement and after careful analysis, 29 items were deleted. The total number of statements was 71 after expert review.
4. **Focus group discussion II:**
   Another focus group discussion was conducted with 3 people, (research scholars). They rated the questionnaire (this helps to rule out irrelevant items, if any). No statements were deleted.
5. **Data collection:**
   The data was collected from 30 learning disabled students aged between 10 to 15 years. All samples were cooperative.

6. Item analysis:

Item analysis is the technique through which those items which are valid and suited to the purpose are selected and the rest are either eliminated or modified to suit the purpose. In addition, item analysis is valuable for increasing instructors' skills in test construction, and identifying specific areas of course content which need greater emphasis or clarity. The two most common indices which item analysis reveals are the facility/difficulty index (FI) value and the discrimination index (DI) value. Two methods were selected in discrimination index; Item -total score correlation and Total Item correlation. (ScorePak Item Analysis, 2005).

RESULTS

The Facility index value and Discrimination Index value are shown in the tables below:

Table no.1 showing the Facility Index [FI] value for 71 statements.

Sl.No.	Statements	FI Value
1	I can make an outline of what I have to do.	0.49
2	I can decide what all things are needed to complete my assignment.	0.36
3	I can focus on the work I am doing.	0.46
4	I can memorize things easily.	0.44
5	I find it very hard to decide among available alternatives.	0.46
6	I am good in problem solving.	0.51
7	I can start an activity immediately.	0.48
8	I can do a task continuously.	0.46
9	I have difficulty in changing tasks.	0.58
10	I am able to do two tasks at same time.	0.52
11	My work will always be systematic.	0.39
12	I do not organize a task properly.	0.42
13	I do my work according to the instructions given to do the task.	0.46
14	I cannot remember that happened half an hour ago.	0.74
15	I can complete my work without any distractions.	0.52
16	I take wrong decisions.	0.74
17	I try to solve problems without expecting help from others.	0.55
18	I tend to postponed my works .	0.54
19	I feel irritated when I have to work without rest.	0.52
20	I am not able to adapt to change easily.	0.56
21	I find it difficult to do two tasks at the same time	0.56
22	I think before doing my works.	0.46
23	I can explain to others what I have to do.	0.47

Sl.No.	Statements	FI Value
24	I can make a timetable for the works to be done.	0.57
25	It takes a lot of time to focus on the task I am doing.	0.53
26	I feel that I forget things easily.	0.66
27	I depend on others for making decisions.	0.54
28	I am able to face any challenges.	0.48
29	I start doing things before others start to do.	0.54
30	I find excuses for not doing the task.	0.6
31	I get confused when there are changes in the given task.	0.52
32	I can take notes when someone is dictating.	0.42
33	I can control my anger.	0.58
34	I have a clear idea of my learning task.	0.44
35	I can complete my works within the given time.	0.45
36	I can focus on a task only for short period of time.	0.52
37	It is difficult for me to repeat what is said to me.	0.56
38	I make right decision.	0.46
39	I take more time in solving a problem.	0.58
40	I am prepared to do a task.	0.62
41	I get scolding for not continuing the task.	0.6
42	I do the first task even if there is new work to do.	0.52
43	I can read and write notes at the same time.	0.48
44	I can control my behaviour.	0.48
45	**I can plan for future activities.**	**0.79***
46	I depend on others for organizing the work.	0.54
47	I feel blank.	0.6
48	I can analyse my task.	0.55
49	I become anxious when I face a problem.	0.55
50	I start a task without proper preparation.	0.57
51	I need continuous motivation for completing the task.	0.64
52	I do not like any changes in the task I am doing (reading, writing).	0.54
53	I am not able to do a task which has multiple steps.	0.68
54	I act according to the situation.	0.52
55	I am not able to plan schedule for a day.	0.63
56	I don't do the tasks that need organizing.	0.59
57	I make simple mistakes in my works.	0.5
58	I forget the instructions given to complete a task.	0.59
59	I take long time to take a decision even on small things.	0.59

Sl.No.	Statements	FI Value
60	I analyse the problem thoroughly before solving it.	0.62
61	I initiate to do new works.	0.5
62	I find it hard to stay on one topic in a conversation.	0.7
63	I can listen to music and dance.	0.59
64	I need constant supervision of others for completion of task.	0.56
65	I have difficulties in prioritizing works.	0.58
66	I can do the work without deviating from the plan.	0.51
67	I make decisions then and there.	0.55
68	I can come up with different solutions to the problem.	0.54
69	I am not interested to start a new work.	0.58
70	I feel difficult to modify my routine according to the changes in the plan.	0.63
71	I over react when someone orders me.	0.53

***shows the items to be eliminated as their FI values are >0.75**

Table no.2 showing the discriminative index (DI) value for 71 items.

Sl.No.	Statements	DI Value 1	DI Value 2
1	I can make an outline of what I have to do.	**-0.24****	**-0.31****
2	I can decide what all things are needed to complete my assignment.	**0.04****	**-0.04****
3	I can focus on the work I am doing.	0.33	0.26
4	I can memorize things easily.	0.41	0.41
5	I find it very hard to decide among available alternatives.	**0.21****	**0.13****
6	I am good in problem solving.	**0.22****	**0.13****
7	I can start an activity immediately.	**0.03****	**-0.03****
8	I can do a task continuously.	**0.03****	**-0.05****
9	I have difficulty in changing tasks.	**0.12****	**0.05****
10	I am able to do two tasks at same time.	**0.01****	**0.04****
11	My work will always be systematic.	**0.13****	**0.06****
12	I do not organize a task properly.	**0.17****	**0.19****
13	I do my work according to the instructions given to do the task.	**0.21****	**0.12****
14	I cannot remember that happened half an hour ago.	**0.05****	**-0.05****
15	I can complete my work without any	**0.04****	**-0.04****

	distractions.		
16	I take wrong decisions.	**-0.03****	**-0.11****
17	I try to solve problems without expecting help from others.	**0.31****	**-0.71****
18	I tend to postponed my works .	**0.27****	**0.20****
19	I feel irritated when I have to work without rest.	0.30	0.25
20	I am not able to adapt to change easily.	**-0.03****	**-0.01****
21	I find difficult to do two tasks at a time.	0.32	0.26
22	I think before doing my works.	**-0.01****	**-0.08****
23	I can explain to others what I have to do.	**0.18****	**-0.86**
24	I can make a timetable for the works to be done.	**0.16****	**0.06****
25	It takes a lot of time to focus on the task I am doing.	**0.27****	**0.18****
26	I feel that I forget things easily.	**0.14****	**0.06****
27	I depend on others for making decisions.	**0.08****	**-0.01****
28	I am able to face any challenges.	**-0.05****	**-0.13****
29	I start doing things before others start to do.	0.34	0.25
30	I find excuses for not doing the task.	**0.19****	**0.11****
31	I get confused when there are changes in the given task.	**0.22****	**0.14****
32	I can take notes when someone is dictating.	**0.19****	**0.12****
33	I can control my anger.	**-0.08****	**-0.17****
34	I have a clear idea of my learning task.	**0.11****	**-0.33****
35	I can complete my works within the given time.	**0.13****	**0.04****
36	I can focus on a task only for short period of time.	**0.01****	**-0.07****
37	It is difficult for me to repeat what is said to me.	**0.04****	**-0.37****
38	I make right decision.	0.32	0.25
39	I take more time in solving a problem.	0.42	0.34
40	I am prepared to do a task.	0.60	0.53
41	I get scolding for not continuing the	**0.25****	**0.16****

	task.		
42	I do the first task even if there is new work to do.	**0.19****	**0.08****
43	I can read and write notes at the same time.	**0.08****	**-0.37****
44	I can control my behaviour.	0.31	0.25
45	I can plan for future activities.	**0.29****	**0.22****
46	I depend on others for organizing the work.	**- 0.80****	**-0.22****
47	I feel blank.	**0.01****	**-0.08****
48	I can analyse my task.	**-0.05****	**-0.09****
49	I become anxious when I face a problem.	**-0.02****	**-0.08****
50	I start a task without proper preparation.	**0.08****	**-0.07****
51	I need continuous motivation for completing the task.	**0.17****	**0.08****
52	I do not like any changes in the task I am doing (readin ,writing).	**0.21****	**0.13****
53	I am not able to do taskswhich has multiple steps.	**0.18****	**0.09****
54	I act according to the situation.	**-0.08****	**-0.18****
55	I am not able to plan schedule for a day.	**0.09****	**0.06****
56	I don't do the task that need organizing.	**0.37****	**0.03****
57	I make simple mistakes in my works.	**0.07****	**-0.02****
58	I forget the instructions given to complete a task.	**0.27****	**0.19****
59	I take long time to take a decision even on small things.	**0.18****	**0.08****
60	I analyse the problem thoroughly before solving it.	**0.03****	**-0.05****
61	I initiate to do new works.	**0.01****	**-0.08****
62	I find it hard to stay on one topic in a conversation.	0.40	0.31
63	I can listen to music and dance.	0.36	0.28
64	I need constant supervision of others for completion of task.	**0.22****	**0.13****
65	I have difficulties in prioritizing works.	**-0.08****	**-0.16****

66	I can do the work without deviating from the plan.	**0.01****	**-0.11****
67	I make decisions then and there.	0.29	0.21
68	I can come up with different solutions to the problem.	**0.04****	**-0.11****
69	I am not interested to start a new work.	0.50	0.42
70	I feel difficult to modify my routine according to the plan .	0.52	0.45
71	I over react when someone orders me.	0.37	0.30

****shows the items to be eliminated as their DI values are <0.30**

Table 3 showing the finalized fifteen items along with their FI and DI values:

S.No	Statements	FI	DI	
			Item total correlation	Total item correlation
01	I can focus on the work I am doing.	0.46	0.33	0.26
02.	I can memorize things easily.	0.44	0.41	0.41
03.	I feel irritated when I have to work without rest.	0.52	0.30	0.25
04.	I find it difficult to do two tasks at the same time	0.56	0.32	0.26
05.	I start doing things before others start to do.	0.54	0.34	0.25
06.	I make right decision.	0.46	0.32	0.25
07.	I take more time in solving a problem.	0.58	0.42	0.34
08.	I am prepared to do a task.	0.62	0.60	0.53
09.	I can control my behaviour.	0.48	0.31	0.25
10.	I find it hard to stay on one topic in a conversation.	0.7	0.40	0.31
11.	I can listen to music and dance.	0.59	0.36	0.28
12.	I make decisions then and there.	0.55	0.29	0.29
13.	I am not interested to start a new work.	0.58	0.50	0.42
14.	I feel difficult to modify my routine according to the changes in the plan.	0.63	0.52	0.45
15.	I over react when someone orders me.	0.53	0.37	0.30

DISCUSSION

From the table 1, the values of facility index (FI) with the * mark denote that there is one item to be excluded as they have the FI value above 0.75 value. The item for which the FI value is more than 0.75 is eliminated. It shows that the item number 45 does not facilitate to answer. Respondents were not able to answer it correctly. The FI value of all other items is below 0.75. So, all items expect item number 45, were included for further analysis.

Also, from the table 2, the values of discrimination index (DI) with the ** mark denote that there are fiftysix items which need to be excluded as they have the DI value below 0.30 value. It must also be noted that many statements had the negative correlation value despite having a good facility index value. After discrimination index 56 items were eliminated. The DI value for all the 56 items were below 0.30. This shows that these items do not differentiate or show individual difference. 15 items were retained after Discrimination Index.

Table 3 brings the finally drafted 15 statements with the accepted values of both the facility index and the discrimination index. These 15 items to be given for posttest and standardization process.

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Conflict of interest: The author declared no conflict of interest.

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