Indonesian Dyslexia Early Identification System

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Table 1: The differences of manual assessment and assessment using proposed system

Aspect	Manual Assessment	Assessment Using Proposed System
Duration	More than 1 day	Shortly after completing the questionnaire
Time	The experts' office hours	Every time as long as there is an internet connection
Place	At the experts' office	Everywhere as long as there is an internet connection
Procedure for identifying children at risk for dyslexia	The parents and child come to the expert for consulting about the child condition	The parents fill the questionnaire about the child background, family background, academic, and non academic experiences at school and home.
	The experts collect information about the child background, family background, academic and non academic experiences at school and home.	
	The experts identify whether the child has a risk of dyslexia.	The system will identify whether the child has a risk of dyslexia.
	The experts tell the identification result to the parents.	
Procedure for identifying the severity level of dyslexia	The parents and child come to the expert for assessing the severity level of dyslexia.	The parents and child come to the certied counselor for assessing the severity level of dyslexia
	The experts observed the child's academic and non academic ability.	The certified counselor observed the child's academic and non academic ability.
	The experts administrate the result manually.	The system administrates the result automatically.
	The experts identify the child's severity level of dyslexia.	The system identify the child's severity level of dyslexia.
	The experts writes the severity level of dyslexia. report	The system writes the severity level of dyslexia report

Figure 1: Designing Instrument and Scoring Method

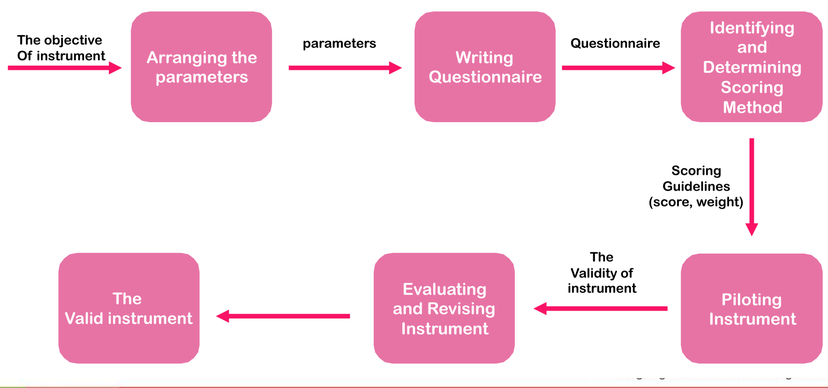


Table 2: Signs/symptoms of Dyslexia based on literature and observations

No	Sign of Dyslexia	No	Sign of Dyslexia	No	Sign of Dyslexia	No	Sign of Dyslexia
1	Difficult in writing and counting.	12	Difficult in reading letters like: b, d p, q u, n m, w 6, 9 5, s, z.	22	Difficult in mentioning the similar words (*misalnya: diada, sama-masa, lagu-gulu, babi-buta, tanam-taman, dapat-padat, mana-nama)*	36	Running slowly
2	The history of family members *(especially siblings, father, and mother)* who are late to talk, and havedifficulty in learning, reading, writing in kindergarten-elementary school, but they were recognized as a bright child in another eld.	13	Difficult in determining right and left.	23	Poor handwriting	37	Ambidexterity, or writing with his left hand or delays settle on one hand
3	Starting talking in the age of more than 3 years old	14	Easy to forget.	24	Short attention, when hearing something	38	Difficulty remembering and following directions
4	The articulation of many vocabulary is unclear.	15	Difficult in memorizing the name of a friends or teacher's name, or the name of the people in their environment.	25	Difficulty in remembering the words	39	easily frustrated
5	Difficult in learning and recognizing rhythms / beats.	16	The IQ is in the normal range or above average.	26	Difficult in understanding the concept of time	40	Difficult in dressing, buttoning clothes and put shoes on the right feet
6	Difficult in Finding the right term in communicating such states thick, deep.	17	Difficult in listening to instructions	27	Difficult in distinguishing vowels with consonants	41	Frequently tripping, bumping into things and falling
7	Difficult in knowing the shape of the letter.	18	Appearing clumsy, and unskilled in doing activities that rely on motoric coordination.	28	Difficult in determining alphabet and symbols	42	Difficult in catching, kicking or throwing a ball, and jumping rope
8	Difficult in knowing the sound of the letter.	19	Difficult in arranging something sequentially for example day of the week or the arrangement of letters and numbers.	29	Difficult in remembering routine daily activities	43	Easy to understand a story based on the pictures that are not related to the text book
9	Speaking sometimes stutter or longer but not coherent / systematic.	20	Difficult in determining the direction	30	Difficult in recognizing symbol arithmetic operations		
10	Difficult in naming the object.	21	Difficult in reading or sounding the words that never found	31	Difficult in defining words / terms that often appear in math. *(such as greater than, less than, equal to)*		
11	Difficult in recognizing the numbers, especially the shape and way of writing often do not follow the general rule. For example, write the numbers one from the lower to upper, write the number eight with an unusual line, etc.			32	Difficult in mentioning a day of the week		
				33	Difficult in telling the time		
				34	less interest in playing games with language sounds *(eg. repetition, Rhyming)*		
				35	Difficult in learning rhyme		

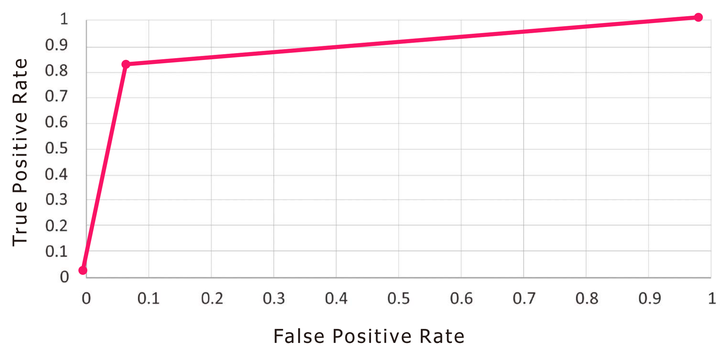
Table 3: True positive, false positive, true negative, false negative, and accuracy of main screening piloting

No	School	Respondent	TP	FP	TN	FN	Accuracy
1	Fatimah Azzahra	23	14	0	4	5	78%
2	Fithrah Insani	29	17	0	6	6	79%
	Total	52	31	0	10	11	79%

Table 4: Analysis of main screening sensitivity, specificity, and accuracy

No	School	Respondent	TP	FP	TN	FN	Sensitivity	Specificity	Accuracy
1	Fitrah Insan Elementary School	46	27	2	11	6	0.818	0.846	83%
2	Indigrow Child Development Center	6	6	0	0	0	1	-	100%
3	Nilem Elementary School	53	29	0	15	9	0.763	1	83%
	Total	105	62	2	26	15	0.805	0.929	84%

Figure 2: Receiver Operating Characteristics Curve for Main Screening



Abstract

Dyslexia is a specific learning difficulty in language areas such as the language used for oral, written and social communication. Dyslexia causes difficulties in reading, writing, spelling and executive function. Therefore dyslexia causes difficulty in reading, further it will affect not only academic success but also self-esteem and social-emotional development. Dyslexia cannot be cured, but the impact can be significantly reduced if identified and well intervened as early as possible (International Dyslexia Association, 2013).

Problems in Indonesia are minimal and unequal dyslexia awareness, huge population that brings high number of dyslexic children, very few dyslexic experts, time and cost ineffecient to get assessment and intervention from reliable center, all led to unintervened cases that prone to poor long-term outcome. Therefore a valid and reliable yet easily accessed tool for identifying risk of dyslexia in pre-school aged is mandatory.

This study proposed dyslexia early identification system for Indonesian which can be used by everyone and applied for child as early as 5 to 7 years old at anywhere and anytime, and generate report that is in line with Indonesian language and culture.

Screening methode is by filling questionnaire - consists of 21 questions for 6-7year old child and 17 questions for 5-6 year old ones- by parents or caregiver of the child. It could be downloaded online from certain website using personal computer or smart phone. Result would be "Risk" or "No Risk" of dyslexia.

The aspects examined in the tool are as follows: children and parents backgrounds, academic and (language used for oral, written and social communication), non-academic abilities (sequences and direction identification, capacity of working memory, and organization ability).

Processes in designing the instruments and the scoring methods were determining the objective of instrument, arranging parameters, writing questionnaire, identifying scoring technique, determining scoring guidelines, piloting instrument, and evaluating.

The total sensitivity was 0.805, the specificity was 0.929, and the accuracy was 84%. (Table 3.8, Table 4.16), and the area under Receiver Operating Characteristics (ROC) was 0.867 - trapezoid shaped (Figure 4.17), meaning it has good accuracy.

Conclusion

Dyslexia early identification system (DEIS) is a good and reliable tool which is valid, high sensitivity and specifity, that can easily be accesed by every one at any time in anywhere as long as there is internet connection, and able to identify whether the children have a risk of dyslexia or not.

Keyword : dyslexia, early screening tool, Indonesia