

ADEM Test

Adult Developmental Eye Movement

English Version

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<https://coocv.com/producto/adem-donacion/>

Considering our service vocation as health professionals, all funds will be given to relevant social labor through the “Casa de la Caridad de Valencia”, allowing them to continue developing their work toward those in need.

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Introduction

The Developmental Eye Movement (DEM)¹ is a simple test widely used to easily characterize the ocular movement of children during reading. It can be applied in any case in which rapid assessment of ocular movements is required. The DEM consists of a series of simple numbers that must be recognized and named. This procedure allows clinicians to measure the speed and precision of ocular movements used to read these numbers.

The Adult Developmental Eye Movement (ADEM) has a structure similar to the DEM. However, the ADEM is more complex because it presents two-digit numbers. This allows the test to be used in older populations, such as adults, and not only in children. First, an initial version ², which was recognized as interesting by a committee of experts ³ was published. Subsequently, the new version ⁴ was developed. This new version includes a modification of the horizontal sheet, which includes the same numbers that the vertical sheets, and considers the potential errors performed.

It is our wish that the ADEM, which is being used in the scientific literature ^{5,6}, and its possibilities serve you to rapidly and easily quantify and analyze the development of ocular movements in patients from different population groups.

References:

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- 2.- Gene-Sampedro A, Richman JE, Pardo MS. The Adult Developmental Eye Movement Test (ADEM), a tool for saccadic evaluation in adults. J Behav Optom. 2003; 14(4):101-5.
- 3.- Radomski MV, Finkelstein M, Llanos I, Scheiman M, Wagener SG. Composition of a vision screen for service members with traumatic brain injury: Consensus using a modified nominal group technique. American Journal of Occupational Therapy, 2014;68(4), 422-9.
- 4.- Gené-Sampedro A, Monteiro PML, Bueno-Gimeno I, Gene-Morales J, Piñero DP. Validation of a Modified Version of the Adult Developmental Eye Movement Test. Scientific Reports, 2021;11(1):1-11. <https://www.nature.com/articles/s41598-021-99245-5>

- 5.- Gené-Sampedro A, Alonso F, Sánchez-Ramos C, Useche SA. Comparing oculomotor efficiency and visual attention between drivers and non-drivers through the Adult Developmental Eye Movement (ADEM) test: A visual-verbal test. PLoS ONE 2021; 16(2): e0246606. <https://doi.org/10.1371/journal.pone.0246606>
- 6.- Gené-Sampedro A, Alonso F, Gene-Morales J, Monteiro PL, Useche SA. Could driving help us to "see better"? A comparative assessment of saccadic efficiency, visual speed, and attention. BMC Ophthalmol. 2024;24(1):90. <https://doi.org/10.1186/s12886-024-03349-1>

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TEST V₁

32	43
71	56
54	21
96	14
81	75
25	54
53	39
74	72
43	43
67	81
14	76
49	47
76	62
62	59
37	93
73	23
67	34
35	67
78	41
91	18

TEST V₂

61	76
34	92
26	33
93	95
12	24
71	19
46	44
65	72
58	61
29	36
57	25
35	58
76	74
44	47
84	66
43	31
41	76
56	56
29	97
18	85

TEST H

32		76	53		96		81
25	56			74	43		65
18			43		75	62	41
71		92		37	97		24
44	58				25		14
57			36		78	47	84
72	47		61	56			29
93		18			39	62	41
66	34	21		67			12
76				44	67	56	31
58		33	72		49		81
43			54		23		14
76	93	35			91		29
19			46		76	67	34
26		59		71		43	61
35	76		54		95		85

The ADEM consists of three sheets: two to be read vertically (vertical sheet 1 [V1] and vertical sheet 2 [V2]), and one to be read horizontally (horizontal sheet [H]). Please find attached an answer template (Annex 1) to be filled in by the evaluator along with the results obtained by the patient. Additionally, a sheet to be shown to the patient before conducting the test is presented in Annex 2. This sheet explains how reading should be performed on Vertical sheets (V) and Horizontal sheets (H).

The three test sheets comprise two subtests with increasing difficulty: from a simpler task in V1 and V2 to a more complex task in H. The test must be performed in the following order: V1, V2, and H.

It is recommended to print the test sheets in DIN A-4 format.

- 1) The subject to be evaluated must be seated at an appropriate distance to comfortably read (approximately 45 cm). Appropriate lighting for reading numbers must be provided.
- 2) The test must be conducted with both eyes open, and if the subject commonly wears glasses, glasses must be worn for the test.
- 3) The subject to be evaluated is allowed to hold the sheet with both hands. Otherwise, the sheet is placed on the table. It must be ensured that no uncomfortable lighting or reflections appear on the test sheet during the performance.
- 4) The test consists of reading the numbers in each sheet out loud. Before starting the test, the sheet must be placed face down (numbers facing the ground, not visible). The test time starts when the first number is read out loud. If an error is made while reading any number, the test must be continued.
- 5) The errors made when reading the numbers must be recorded by the evaluator. Due to the relatively fast speed at which some subjects can read, it is recommended to make an audio recording, so that it can be reviewed ex-post to identify potential errors. The recording can be performed with a computer microphone, a mobile phone, or a voice recorder, depending on the evaluator's preferences.

Errors that must be written in the answer sheet (Annex 1):

- Omission (O): When a number is not read. Draw a circle (O) around the omitted number.
- Transposition (T): A number is not read in the appropriate order. Draw a vertical arrow (↑) on the right-hand side of the number changed.
- Addition (A): When the subject adds or repeats a number. A hyphen (-) is written on the right-hand side of the number repeated. Additionally, when the subject reads a number not on the sheet, it must be written between brackets next to the hyphen.
- Substitution (S): When a number is pronounced wrongly. Draw a slash (/) on the right-hand side of the number wrongly pronounced.

Specific instructions of the ADEM

Example sheets V and H (Annex 2) are shown to the subject. The following instructions must be said exactly as presented hereafter (text in bold and italic font): ***“You must read out loud as fast as possible a series of numbers vertically distributed. You must start by the left column and from top to bottom. Once finished with this column (point it out with the finger in the example sheet), with no pause, you must continue reading out loud the right column from top to bottom. If you make an error, do not worry about it, just continue performing the test.”***

When the subject is ready, the sheet named V1 must be shown to him/her and placed face down, with the numbers facing the ground. The subject will be told: ***“When I say start, turn the sheet over and start reading out loud the numbers as I previously told you, from top to bottom as fast as possible. The time will start whenever you read the first number.”***

The time needed to read all the 40 numbers on the sheet is registered. The time is started when the subject reads the first number, and the time ends when the last number of the second column is read. The time (in seconds, with a margin of 0.1 seconds) needed to read all the numbers and the errors made are written in the answer sheet.

The same procedures are used for the sheet named V2 and time (in seconds) and errors are recorded.

Afterward, the subject must be told that the numbers to be read out loud and as fast as possible, in this case, will be horizontally distributed. For this purpose, the example sheet (Annex 2) is shown to the subject, more specifically the bottom part of the sheet. The

following instructions must be said exactly as presented hereafter (text in bold and italic font): ***“Now, you must read out loud as fast as possible a series of numbers horizontally distributed. You must start from the top and read from left to right all the lines from the top to the bottom (point it out with the finger in the example sheet). If you make an error, do not worry about it, just continue performing the test.”***

When the subject is ready, the sheet named H must be shown to him/her and placed face down, with the numbers facing the ground. As in the vertical sheets, the time starts when the subject names the first number. The time needed to read all the numbers (in seconds) and the errors done are recorded.

Population values are presented in the articles included in the references. Additionally, information on how to analyze the results is presented.

Annex 1.- Register of the ocular movements ADEM (Response Template)

Answer templates ADEM

Reference: _____

V1	
32	43
71	56
54	21
96	14
81	75
25	54
53	39
74	72
43	43
67	81
14	76
49	47
76	62
62	59
37	93
73	23
67	34
35	67
78	41
91	18

Time V1: sec.

O: ☐

S: ☒

A: ☐

T: ☒

V2	
61	76
34	92
26	33
93	95
12	24
71	19
46	44
65	72
58	61
29	36
57	25
35	58
76	74
44	47
84	66
43	31
41	76
56	56
29	97
18	85

Time V2: sec.

O: ☐

S: ☒

A: ☐

T: ☒

Age: _____ (note years, months)

Sex: M F (circle)

H				
32	76	53	96	81
25	56	74	43	65
18	43	75	62	41
71	92	37	97	24
44	58	25	14	73
57	36	78	47	84
72	47	61	56	29
93	18	39	62	41
66	34	21	67	12
76	44	67	56	31
58	33	72	49	81
43	54	23	14	74
76	93	35	91	29
19	46	76	67	34
26	59	71	43	61
35	76	54	95	85

Time H: sec.

O: ☐

S: ☒

A: ☐

T: ☒

V1 sec

V2 sec

H sec

eO eA

V1aj sec

V2aj sec

Haj sec

Ratio Haj/(V1+V2) =

Ratio Haj/(V1aj+V2aj) =

Annex 2.- Example sheets to explain how to perform the test

