

Psychological and pedagogic testing of handicapped children with locomotion disorder using multimedia programs

C Sik-Lányi¹ and Á Molnár-Lányi²

¹ Department of Image Processing and Neurocomputing, University Veszprem
Egyetem u. 10. Veszprem, H-8200 Hungary

²National Committee for the Experts of Testing Movement and Rehabilitation and Centre for Special Needs
Educational Services, Mexikói út. 60. Budapest, H-1145 Hungary

¹*lanyi@almos.vein.hu*

ABSTRACT

We have developed a multimedia-testing program, which helps the testing of cumulatively handicapped children and is specially designed for the testing of handicapped children with locomotive disorder. It has been prepared for the Commission of Investigation and Rehabilitation of Locomotion Disorders and the Centre of Teaching Handicapped Children. The psychological part of the program is the RAVEN test. The pedagogical part of the program contains several tasks the child will find as a playing possibility. Our program had to be developed in such a form that it could be used also by handicapped children with locomotive disorder.

1. INTRODUCTION

The Commission of Investigation and Rehabilitation of Locomotion Disorders and the Centre of Teaching Handicapped Children asked us to develop computer test programs that can be used in investigating the capabilities of handicapped children even if they have locomotoric disorders.

The psychological part of our multimedia-testing programme uses the computerised version of the RAVEN test. There are already other computer versions of the RAVEN test, but these are not suitable to test handicapped children with locomotoric disorders. The problem is that children with locomotoric disorder are unable to perform fine movements as needed to work with a mouse or a keyboard. A program has been designed that is much easier to use.

Our pedagogic aim was to deal with questions of form, colour identification, the investigation of mathematical knowledge.

In the present paper we will show the complex testing tasks of the commission, pointing out for whom the programs have been developed and we will give a short demonstration of the programs. The oral presentation will deal with the results of using the program as well.

2. TASK OF THE COMMISSION IN PROVIDING RECOMMENDATIONS

Every country deals with the education of handicapped children. This is, however, different in different countries, depending on their tradition, law making customs and economic strength. These guidelines reflect at the same time their state of economic development. At the present moment the Hungarian school system undergoes permanent changes, parents can now choose between a high number of educational school systems. In 1993 a new Law of Compulsory Education was accepted, which extended the compulsory education also to children who can not taught in the traditional form. Compulsory education is between the age of 6 and 18, but this can be extended for children with locomotoric defects till their age of 21. The National Rehabilitation Board descides on the starting of the compulsory education, on its extension the teacher's board and the Board can decide.

The co-workers of the National Expert Board form a team. Members of this team are physicians, psychologists, and teachers of handicapped children, physiotherapists, teachers and conductors. This team

has the task to investigate the children by the help of complex medical, psychological and locomotoric investigation. The testing deals with:

- the mental capabilities of the student for learning
- their ripeness
- their speech
- their capability of arranging things around themselves
- their capability of moving.

Based on this input data and checking also their environment the team has to make recommendation on the type of educational institution the child should attend.

Handicapped children with different types of handicaps can deal with their compulsory education in different school systems, depending also on their mental state of health:

Children can get special education, teaching if:

- they are handicapped in learning,
- if they are mentally retarded,
- if they are both mentally retarded and have severe locomotive disorders.

Those children, who have difficulties in their movement and can not attend the special ground educational schools of their locality, can attend special institutions designed specially for handicapped children with locomotive disorders.

The Law of Public Education is a positive step forward, it deals also with those children, who are in the age of compulsory education but have been regarded as non-teachable mentally handicapped having also locomotoric disability. Children with severe mental problems and locomotorically handicapped are not taught at present in schools similar to normal schools but get pedagogic training specially adapted to their needs. This is called by the law "compulsory instruction". It can be individual instruction or done in small groups. This type of instruction is provided both for children who live in families or who are in a social or other institution run by a Church. As mentioned the instruction is normally for children in the age between 6 and 18 years, but if necessary it can be extended based on the recommendation of the Expert and Rehabilitation Board. Before the child gets into a course it gets tested by the Expert Commission. Based on this diagnostic test an instructional program is set up to work out the positive features the child can deal with.

It is difficult to test the capabilities of mentally handicapped children with locomotive disorder:

- it is difficult to establish the necessary mutual communication ,
- in front of the team they get into a new situation and the new and foreign environment can have negative effects on their mood.

Due to this the major form of their testing is their study. This can be extended by using different question forms, using test scales and other tests. Besides of this it is very important to investigate the environment of the handicapped child.

The instruction programme is set up according to the recommendations of the Expert committee, it is extended by further programs of locomotive instructions, logopedia, hydrotherapy, etc. This instruction programme becomes part of the normal tutorial year, it encompasses at least five hours of instructions per week. It is financed by the state fiscal programme. The financial means are supplied via the educational institution. The Expert Commission provides instruction also for children living in families by sending teachers of handicapped children and conductors to the families.

The effectiveness of the education, instruction of children with locomotive disorder is most effective if started at an early age. Therefore the Board checks the children with locomotive disorder starting at the age of three years. If requested they perform also control investigations. The diagnosis always contains information on the capability of moving, the mental status, and eventual further disabilities and contains correction advises. Based on this expert advice the parents of the handicapped child have to decide on the possible schooling – taking the present possibilities into consideration.

From the above it can be seen how complex and full of responsibilities it is to decide on the fate of a child. Our complex computer test and tutorial programs are to help this work and to make it more objective. The first step into this direction is the computer program we introduce in this paper

3. THE PROGRAMME

3.1 The psychological test of the programme, the RAVEN test

The RAVEN test is a perceptive, non-verbal test to investigate the intelligence of the child. Factor-analysis has shown that the general intelligence correlates mostly with the understanding of the perceptual, non-verbal relations. RAVEN (1938) formulated the theory in his test series called „Progressive matrices. RAVEN and his co-workers standardised this test in Dumfires in 1949, based on investigations performed on 608 children in the age of 5 ½ to 11 years. Their results have been summarised in a table showing the percentile points for groups of six months intervals.

Task of the investigation: the empty part of a picture with a figure has to be filled in. The picture shows a regular pattern or figures in two dimensions (vertical and horizontal). The correct response supposes that the test person realises the structure of two rows and selects the correct pattern to fill in the empty space. This means that he or she has to realise two ordering principles, has to comprehend the regularity of the pattern or has to find out the proper sequence of the sub-patterns or figures. To complete the test the test person needs to perform complex logical tasks.

Details of the test: The test contains 36 tables. On every table in the upper part the picture is seen, in this picture there is a part where the structure is missing (missing unit). This missing part has a well observable border. Below the picture there are a number of smaller units of the same size as the missing unit in the picture. These units have different internal structure and the task of the test person is to find out the unit that has the same structure as missing in the main picture. (See Figure 1.)

The units, from which the test person can select a unit, are numbered. The test person has to state that number for which he/she thinks the pattern of the unit will fit the empty square in the main picture. (As the multiply handicapped child might not know the numbers, he or she can point onto the fitting square. But a child with locomotoric difficulties might not be able to point to a unit. Thus the RAVEN test can not be used with them in the traditional fashion. This has been considered when the computer version has been developed.) At the traditional test the test conductor makes written remarks on the test sheet, he/she takes notes on the number the test person has selected. The programmed version fills in the test sheet automatically. The 36 tasks are subdivided into three categories. The categories are enumerated with the letters “A”, “AB”, “B” and carry the numbers 1 to 12. The first task is thus A1, the last one is B12.

The group A contains pictures with homogeneous structure. The test person can select the unit that corresponds to the empty square by inserting the unit into the square. There are six units from which the test person has to select the unit with the correct pattern (see Figure 2.)

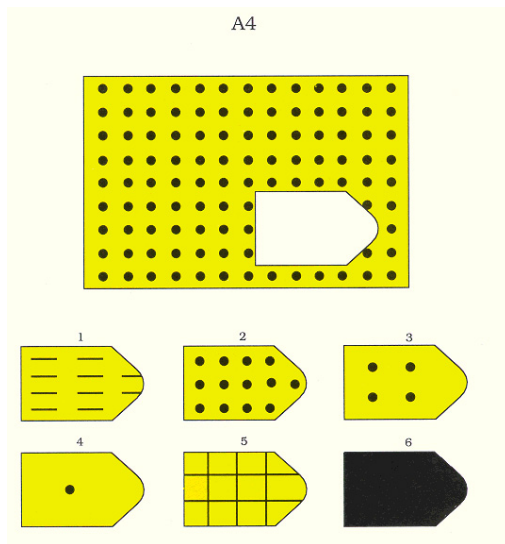


Figure 1. A task from the RAVEN test.

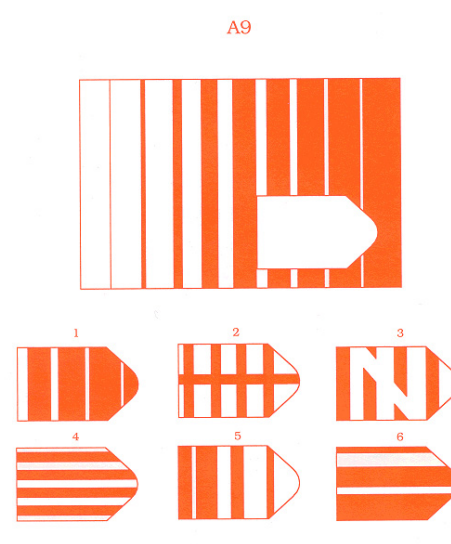
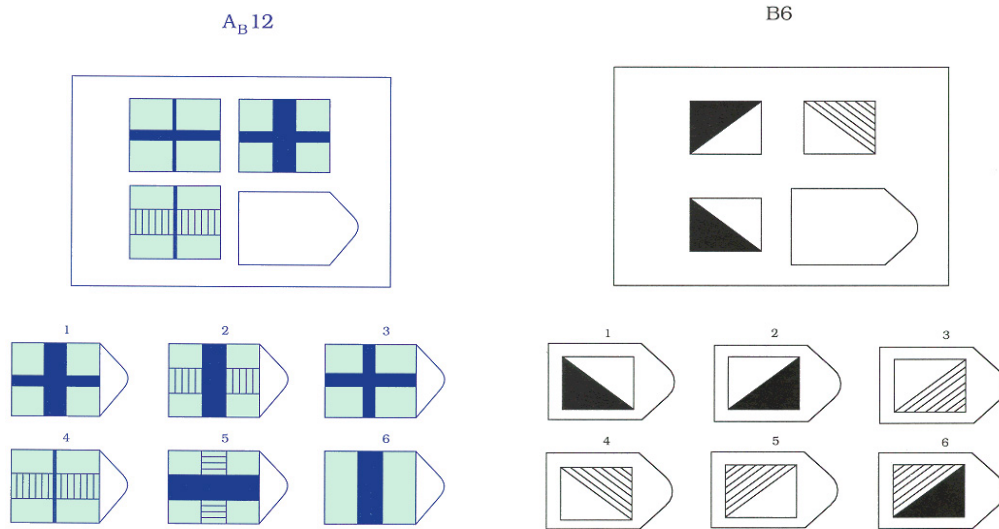


Figure 2. Sample from Group A.

Groups “AB” and “B” contain pictures that are composed from four units. In the first three tasks of the groups four-four units are the same, in the following ones the four units together form a logical order. The selection can be performed from six units (see Figures 3. and 4.). All three groups start with simple tasks that are easy to perform. But in every group the task become more difficult as one progresses among the tasks.

The groups themselves are also arranged in order of difficulty. The author has chosen this arrangement, because he found that the test persons learn in doing the experiments.



Figures 3. and 4. *Examples from the Groups "AB" and "B".*

Performing the investigation: We use the test with children of age 5 to 11 years. The standards provide indications for children of 5 ½ years of age on. The investigation is done in individual tests. We start the program. At the beginning the children still do not realise what the result will be when they insert the selected unit into the picture, and they are not very cautious in their selections. The conductor of the experiment has to tell them clearly what their task is and keep them alert to perform the task correctly.

The RAVEN test in its form developed by us is similar to the traditional one. The main difference is that the handicapped children with locomotoric disorder are unable to use the mouse or the keyboard of the computer. When the new test frame appears the computer waits for a keystroke. This can be any key on the keyboard or even on the keyboard of the special Intellikeys keyboard. This provides ample time to look at all the units from which the child can select. Then the units fade and always only one is highlighted. The test person has to signal that just the right unit is highlighted, when he or she thinks that that unit should be inserted into the main picture. The test does not record the time, thus the test person can wait for several fading and sequential highlighting cycles. (See Figure 5.) At the end the program provides attest sheet similar to the sheet filled in the conventional test by the test conductor. The fading and highlighting speed can be adjusted.

The comparison of the test result sheet with results obtained using control groups and the traditional test, are in progress, the oral presentation will show some results.

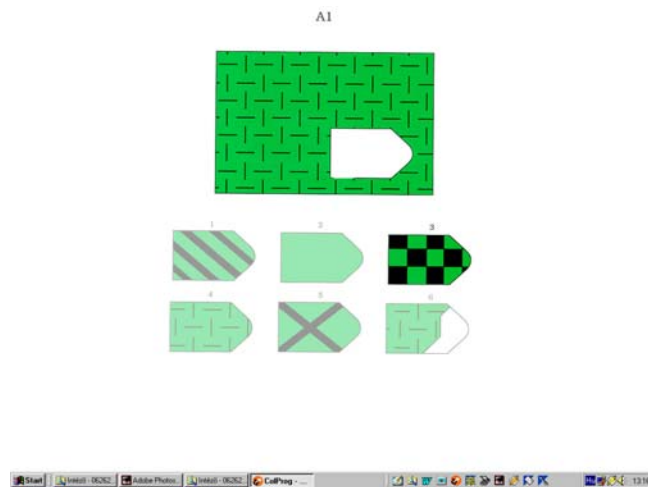


Figure 5. *Examples for the fading.*

3.2 The pedagogical investigation part of the program

The pedagogical part of the program contains several tasks the child will find as a playing possibility. It consists of four major parts:

3.2.1 Tasks similar to those of the S.O.N. tasks. The first part contains tasks similar to those of the Snijders – Oomen test. They contain non-verbal intelligence test. They are grouped around a main program called “story-tree”. Parts of it are: Pictures that belong together, analogies, sorting tasks, combinations, memory tasks, filling in, ordering pictures. After selecting the task type we get into a room, where we can select to move into task A, B or C. There is a small picture of the story-tree on the wall, this signals that we can get back into the main menu by clicking it (see Figures 6 and 7). Due to place limitations we will deal here only with some examples.



Figures 6. and 7. “Story-tree” and returning to the main menu.

Pictures that are related to each other: One has to pair two groups of pictures, drawings. Thus e.g. in one group there are a closed box, closed window, closed door; in the other there are an open box, open window, open door. Thus in case of a good answer there is a symmetry relationship between the two groups.

Analogies: Here a cyclic raw is produced on the screen, similarly as in the task-plates used in kindergartens, and this raw has to be continued. Thus e.g. green rod, white rod, green rod, white rod, green rod etc., or red circle, red circle, blue circle, red circle, red circle, blue circle, continue.

Sorting: The elements of a set have to be sorted into to disjunct sets. Thus e.g. there are a number of circles and triangles on the screen and the task is to group them into two parts. One set should contain only circles the other triangles.

Combination: In this task a missing part of a picture has to be filled in, or from smaller parts a picture has to be build. This corresponds to the traditional puzzle toy.

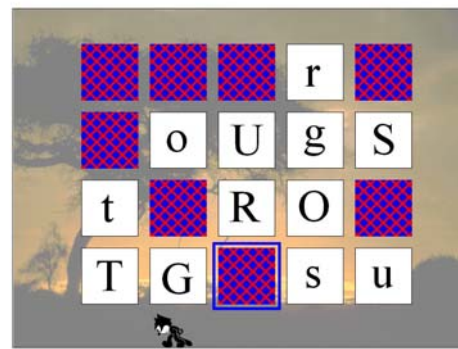
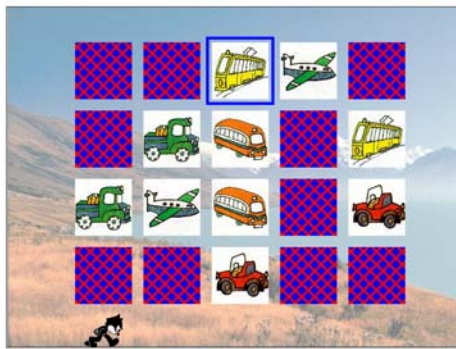
Memory pictures: On the lower side of the monitor there are three hidden pictures, on the upper part there are six hidden pictures. In this task only one picture can be seen at a time. First one of the pictures is seen in the lower row, then it gets hidden again. Then a picture is seen in the upper row. This repeats itself till the child does not find the corresponding picture in the upper row.

Filling in: Here first the child sees eight parts of four pictures (every picture has been halved) in random order. The task is to build the four original pictures.

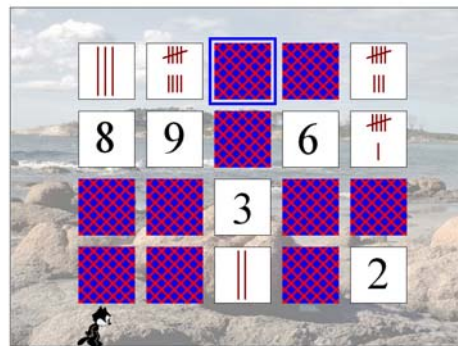
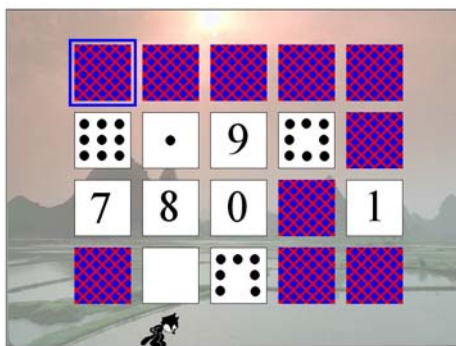
Ordering of pictures: The pictures of a story are seen in random order. The task is to order the sequence of the pictures into a logical sequence. Thus e.g.: 1st picture: going to bed; 2nd picture: bathing; 4th picture: Brushing tooth; 3rd picture: dinner; 5th picture: washing hands; 6th picture: laying the table.

3.2.2 Memory toy. In the memory toy one has to find e.g. a picture to an other one (Fig. 8.), capital letters to small letters (Fig. 9.), number of points to the number (Fig. 10.), lines to numbers (Fig. 11.), the first character of a word to a picture (Fig. 12.), the second character of a word to a picture (Fig. 13.), the third character of a word to a picture. This part of the program contains also a toy using logical pages, where the understanding of the icons depicted on the left side of the screen is the task (see Fig. 14.) and deals also with tasks of colour (blue, green, red, yellow), form (circle, triangle, square), size (small, large), filled or empty and tasks using form-tables (Fig. 15.). In this part we have re-designed conventional form tables in a computerised form. The program shows the outlines of well known geometric or story figures, and at the

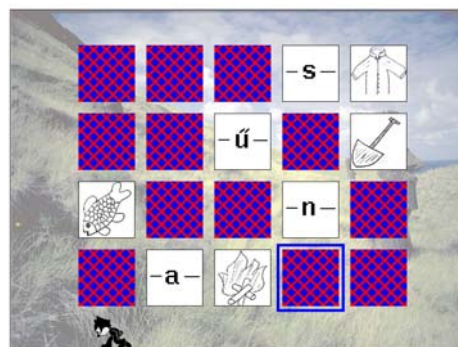
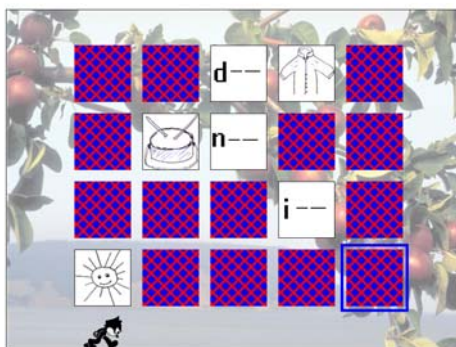
bottom of the screen the real pictures of these are shown. The task of the child is to insert the proper picture into the corresponding outline.



Figures 8. and 9. Memory toy: a picture to an other one, and capital letters to small letters.



Figures 10. and 11. Memory toy: number of points to the number, and lines to numbers.



Figures 12. and 13. Memory toy: the first and second character of a word to a picture.

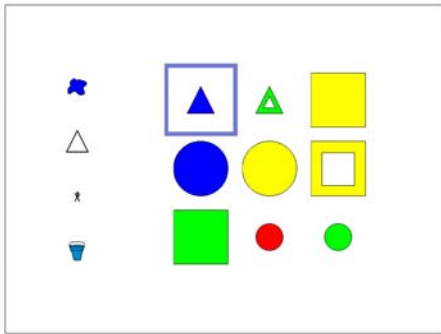


Figure 14. Logical pages.



Figure 15. Form-tables.

3.2.3 *Painting.* As seen on Figure 16 the task is to paint well known objects according to the rules shown on the left upper corner of the screen. This test can be used to test the capability of larger children to understand text passages.

3.2.4 *Bonus animations.* The bonus animations are not part of the test task. After completing the exhausting tasks the child can choose from the bookcase an animation (see Fig. 17). These animations are based on well-known Hungarian children-rhymes.

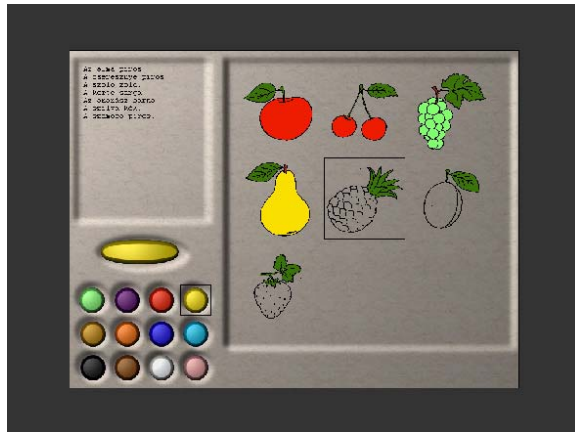


Figure 16. Painting.



Figure 17. Bonus animations.

3.2.5 *Results obtained using these pedagogical investigations.* We test this program both with children having locomotive problems but who are otherwise of normal mental stage, and with children being multi-handicapped. The results of these tests will be summarised at the meeting.

4. SUMMARY

A multimedia test program has been prepared to test handicapped children with locomotive disorder. The problem is that children with locomotoric disorder are unable to perform fine movements as needed to work with a mouse or a keyboard. A program has been designed that is much easier to use. Our program contains a part where the RAVEN test has been computerised in form usable also by children with locomotive disorders, an other part contains test similar to those provided by the S.O.N. test, for example: pictures that belong together, analogies, sorting tasks, combinations, memory tasks, filling in, ordering pictures. This part contains also memory-toys, form-tables, painting tasks, and logical pages. At the end of the test the child can select bonus animation.

The multimedia program can be used in the entire country in testing groups. We are in the course together pedagogic and psychological feedback on the use of the program in case of different types of handicapped children. The oral presentation will show also results of these investigations. The program has been built in a form to be user-friendly, no computer knowledge is needed to use it. Any teacher of handicapped children, or psychologist can learn it in seconds. In the oral presentation we will show the complex testing tasks of the

commission, pointing out for whom the programs have been developed and we will give a short demonstration of the programs. The oral presentation will deal with the results of using the program as well.

5. REFERENCES

- Molnárné Lányi, Ágnes: (2000) Az Országos Szakértői Bizottság a halmozottan sérült gyermekekről, Gyógypedagógiai Szemle Különszáma, 92-100. oldal
- Molnár-Lányi, Ágnes: (2000) The National Committee of Experts' report on multi-handicapped children, Review for the education of handicapped children, Special Issue pp. 92-100.
- RAVEN'S PROGRESSIVE MATRIES: (1998) Published by Oxford Psychologists Press Ltd, Lambourne House, 311-321 Banbury Road, Oxford, OX2 7JH