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May 2014

A Study of Assessments of Children's Physiological Development

Summary

Between December 2013 and May 2014, Fit 2 Learn carried out assessments of 76 children in three schools in order to determine individual levels of physical and cognitive development. This paper describes the findings of those assessments.

The assessments consisted of a variety of exercises to test students' gross motor skills, mid-line crossing and cognitive skills.

74 of the children were selected by their schools because they were having learning difficulties and were potential participants in the Fit 2 Learn school programme.

One school was asked to select an additional two children that they considered to be progressing well, in order to provide a contrast with the rest of the cohort and to help with staff training.

The assessments revealed that:

- all the children, including the two able ones, were found to have problems with at least one of gross motor skills, mid-line crossing and binocular vision.
- most of the children used coping strategies which, in the long term, will not help them to address the fundamental problems of poor cognitive processing.

Assessments are important because:

- Poor physical skills reduce the quality of inputs to the brain and result in lower levels of cognition.
- It is essential to know the level of a child's cognitive and physical skills in order to understand the impact of other educational interventions.

Fit 2 Learn is now running 12-month pilot programmes in three schools. The aims of these pilots are to:

- help the students overcome their physiological delays and improve cognitive processing;
- train school staff to work with the students on a daily basis and, in the long term, run the programmes themselves; and
- gather evidence to show that running Cognitive Visual Integration Therapy (CVIT) programmes in schools can improve students' physiology and lead to significant progress in students' cognitive skills.

Background

CVIT has been developed over thirty years and is practised in South Africa and in the UK. Daleen Smith is a CVIT practitioner who has been helping children to overcome physical and cognitive developmental problems for 20 years in her private practice.

Fit 2 Learn was formed at the end of 2012 in order to show that CVIT can be scaled up and run in schools, thus helping many more students overcome learning difficulties. Fit 2 Learn is a Community Interest Company ("social enterprise").

At the start of a CVIT programme, each subject is assessed to establish their current physical and cognitive levels.

CVIT includes the following therapies:

a) Suppression of primary reflexes and control of mid-line crossing, through gross and fine motor skill exercises[1];
b) Tomatis therapy[2] to enhance cognitive auditory processing and vestibular integration;
c) Behavioural optometry exercises[3] to develop eye control so that both eyes work smoothly together and send effective messages to the brain;
d) Cognitive exercises to develop, strengthen and ultimately integrate the links between the sensory system and the brain.

It has been seen that, in private practice, it can take up to two years for individuals to complete the CVIT programme, depending on their initial level of development and the commitment of the child and their carers. The programme ends when the subject starts to fill in the gaps in their learning and develop a holistic view of the world.

CVIT is not a panacea – there are other important factors such as sleep, diet and family circumstances - but the therapy is designed to remove input blockages to cognitive processing, so that those who complete the programme are able to develop skills in any chosen field. Furthermore, self-esteem and confidence are boosted, so the desire to learn and develop is enhanced.

[1] S.Goddard-Blythe, (2012) Assessing Neuromotor Readiness for Learning, Wiley-Blackwell, U.K.
[2] Gilmore, Tim (1999). "The Efficacy of the Tomatis Method for Children with Learning and Communication Disorders: A Meta-Analysis". International Journal of Listening Vol. 13:12
[3] M.M.Scheiman and M.W.Rouse, (2006) Optometric Management of Learning-Related Vision Problems, Mosby Elsevier, U.S.A

Introduction

Study Aims and Rationale

This paper describes the developmental issues that have been identified during the initial assessments of 76 children between October 2013 and May 2014.

Data from CVIT in private practice provides evidence that, in order to be effective learners, individuals need to be skilled at using their visual system, which needs to be properly integrated with muscle systems and the other sensory systems[4].

Cognitive skills are tested in a number of different ways in order to identify developmental problems together with the coping strategies used to mask or compensate for those problems. Coping strategies have limitations which can create stress when they are no longer fit for purpose, such as when a student is required to perform a task in a different way to the one for which they have developed a strategy.

Study Research Questions

1. Are there fundamental processing difficulties and characteristics which are common to struggling students?
2. How long does it take to assess a child?
3. Can the assessment process be improved by using more sophisticated technology?

Methods

Research Design

Fit 2 Learn carried out assessments of students in three schools that had agreed to work with Fit 2 Learn for 12 months. The schools were selected on the grounds that they:

- believed that that the Fit 2 Learn programme would help students that were struggling to make progress;
- agreed to support the demands of the programme, five days a week, for the duration of the programme;
- agreed to provide Teaching Assistants who would be trained in CVIT and supervise the children's daily exercises.

Fit 2 Learn is using these engagements to develop their programmes, develop best practice and build evidence that CVIT is effective in a school environment and can address underlying developmental problems.

The key physical skills and abilities monitored are:

a) gross motor skills, mid-line crossing and balance;

[4] Cognitive Visual Integration Therapy - An Assessment
http://www.fit-2-learn.com/further-research/cvit-academic-paper

b) visual anomalies including tracking of both eyes individually whilst: focusing on a fixed point; moving between points; and reading text;
c) ability to solve cognitive puzzles, specifically memory and pattern recognition.

Sample Strategy

Fit 2 Learn met with members of school senior leadership teams to explain the theory and practice of CVIT. Having agreed to participate in the programme, the schools selected students to be assessed and were encouraged to choose those that they considered to have learning difficulties. They also provided one or two students that they considered to be making satisfactory progress, in order to provide a contrast with the rest of the cohort and enhance teacher understanding.

Having reviewed the assessments, the schools selected those children that they felt would benefit most from CVIT since not all the students assessed could be accommodated on the programme.

Fit 2 Learn's aim was to gather a broad sample of results which would demonstrate the scale of developmental delay and provide the basis for carrying out larger scale research into the effectiveness of CVIT.

By running the programme in three schools, Fit 2 Learn would also able to identify practical issues that hamper the effectiveness of the programme and develop strategies to overcome such issues, prior to running more extensive trials.

Data Collection

- Data for gross motor skills and cognitive puzzles was collected through observation by a CVIT practitioner who determined whether a child was skilled or unskilled in performing each exercise, and what coping strategies they were using, if any.
- Data for visual anomalies was collected using Visagraph (eye movement tracking and recording) technology, which calculates values for specific abilities e.g reading speed, differences in eye movements etc. and also provides a graphical representation of how the eyes are working together.

Data Analysis

For each test (e.g. sit-ups, pattern matching, memory etc.) the number of students skilled and unskilled was counted. For the cognitive puzzle tests, the number using coping strategies was also counted. These results indicate the extent to which students with learning difficulties have physical, developmental problems (that can very often be corrected with CVIT).

Describing the Sample

The sample consisted of 74 children that were considered to have learning difficulties, and two other children that the school considered were making satisfactory progress. The

children were between the ages of 6 and 16, the majority (68%) being 7-9 years old. The sample contained slightly more boys (54%) than girls (46%).

The children come from two mixed sex community primary schools for children aged 3-11 years and one girls' secondary school for children aged 11-18 years. The primary schools are both located on the same housing estate which is classified, using the Index of Multiple Deprivation, 2007, as being an area in "the most deprived 20% in England". (See Appendix for contextualised school profiles)

	Students	Boys	Girls
Year 2	2	2	0
Year 3	27	18	9
Year 4	16	11	5
Year 5	15	10	5
Year 7	15	0	15
Year 11	1	0	1
Total	76	41	35

Findings

Gross Motor Skills

Children were tested for their ability to perform:

a) Angels in the Snow
The ability to move opposing limbs (left arm/right leg and right arm/left leg) without moving other limbs. This checks proficiency with mid-line crossing whilst lying down (i.e. in the horizontal plane) and ability to suppress primary reflexes.

59 (78%) of the children could not efficiently move opposing limbs indicating that they struggled with mid-line crossing and suppression of primary reflexes.

b) Skipping Forwards and Backwards
The ability to skip forwards and backwards, moving left arm with right leg and right arm with left leg. This checks ability to move opposing limbs in the vertical plane i.e. another test of mid-line crossing.

68 (89%) of the children could not skip both forwards and backwards with opposing limbs.

The causes of difficulties include not having mastered the foot movements necessary to make a skipping movement and not having mastered moving arms in opposition to leg movements.

c) Balancing on One Leg
The ability to stand on one leg for one minute i.e. a simple test of balance.

28 (37%) of the children struggled to balance.

There are many causes for poor balance including muscular, auditory, visual or vestibular integration for example. Failure to balance is not an indication of a specific problem in itself.

d) Throwing a ball from one hand to another across the mid-line.
The ability for the left brain to communicate effectively with the right brain and vice versa.

57 (75%) of the children struggled to throw a ball from one hand to another across their mid-line.

The main features of the failure include:

- refusing to try at all;
- being unable to catch the ball on one or both sides;
- not even attempting to throw the ball across the mid-line, but doing very short passes back and forth very close to the mid-line, or to one side of the mid-line.

e) Sit Ups
The ability to easily and efficiently pull the torso from the floor to an upright position with equal strength on both sides. This test indicates whether a child has the strength to support their body and head for a day at school.

29 (38%) of the children could not efficiently carry out sit-ups.

The causes of difficulties included a lack of core strength and the tendency to pull over to one side.

Visagraph Vision Tests

The Visagraph tracks a subject's left and right eyes as they carry out a series of tests. If the two eyes are not working together then they cannot send effective messages to the brain.

Example

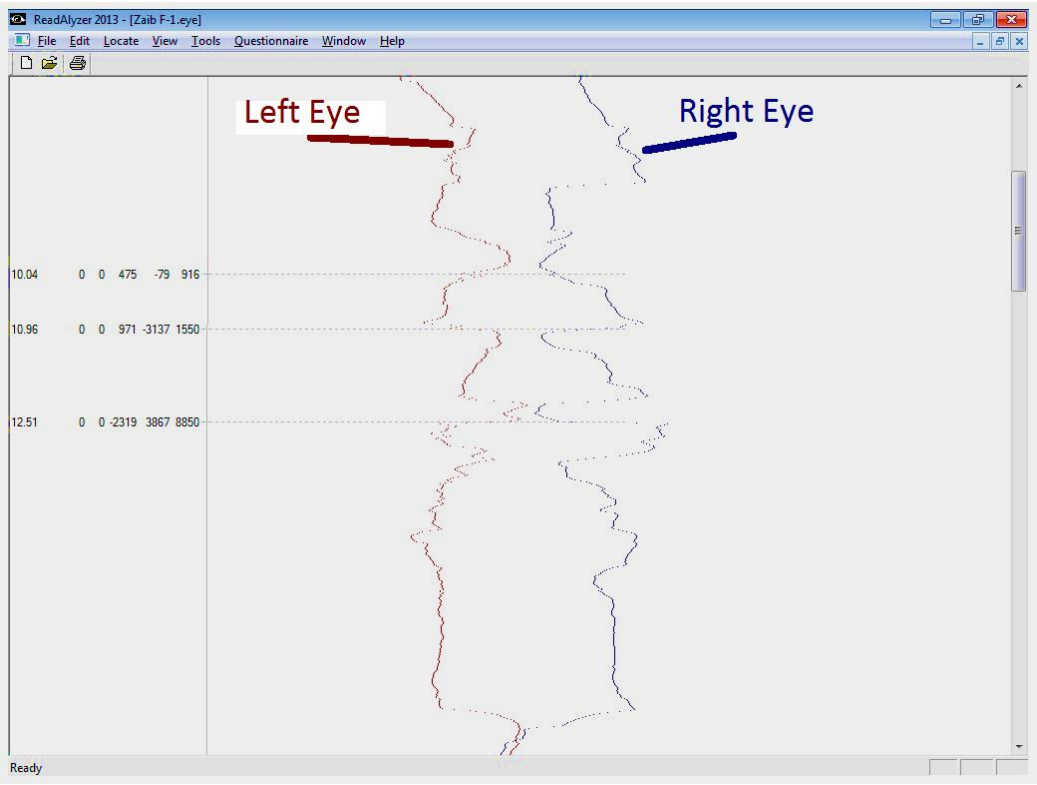
A child born in autumn 2005 was 7 years old in June 2013 when he achieved the following grades in his school assessments:

Reading	p8
Writing	1c
Mathematics	1a

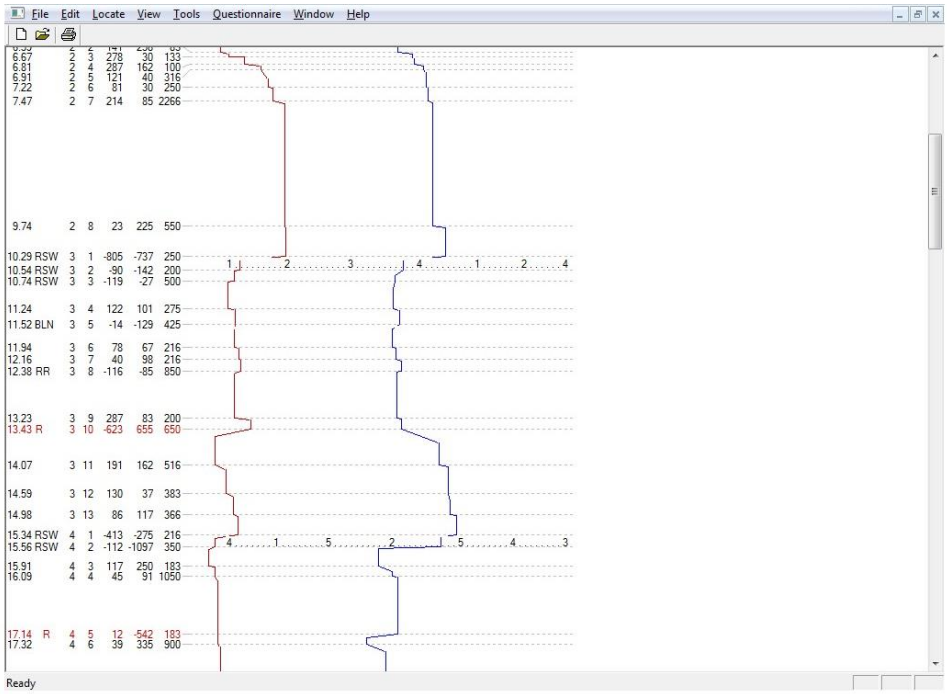
His grades were considerably lower than the average of 2b for his age.

The child was assessed by Fit 2 Learn in December 2013 using the Visagraph. The results clearly indicated that his eyes were not working together and that he could not maintain focus.

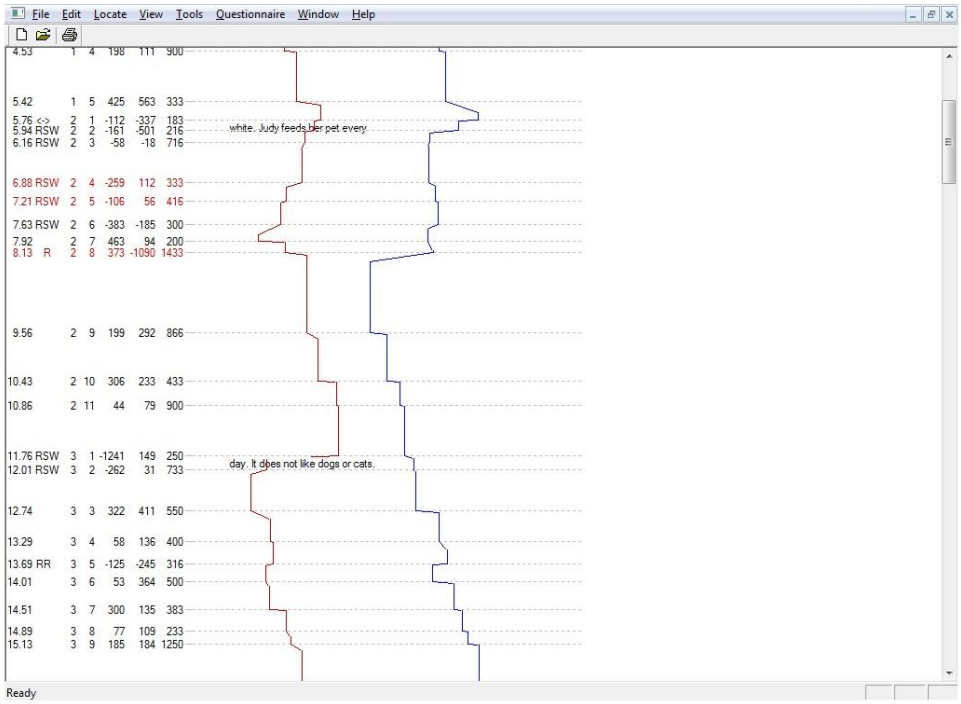
The first test required the child to focus on a fixed point for twenty seconds. The graph below shows how the eyes were moving during the test.



The child was then asked to read a series of numbers to test ability of eyes to track when reading text. Again it was clear that the eyes did not work together and at times were going in opposite directions.



The final visual test consisted of the child reading a simple story. The screenshot below shows how each eye moved.



Again we see that the child is clearly not able to use two eyes together and so is unable to send effective messages to the brain. This will limit the child's ability to process cognitively which was demonstrated in the child's approach to pattern recognition problems (see below).

Cognitive Tests

a) Memory Test

Three or more cards are shown to the child for 60 seconds and then turned over. The child is asked to name the picture on each card as the assessor points to it. The cards are spread widely in front of the child, across the mid-line. The assessor asks the child to recall the cards in no particular order.

68 (89%) of the children used coping strategies (typically auditory and/or tactile) to help them recall the cards. (One refused to do the task and only 7 (9%) completed the task without recourse to other strategies.)

Of those (68) using coping strategies, 66 (97%) were unable to memorise 5 or more cards.

The coping strategies observed included:

- tapping the cards;
- rocking or moving the body, in order to avoid working across the mid-line;
- verbally listing the cards in order to by-pass the visual system and send a message to the auditory system, such that in order to recall one item in the sequence, the child

needs to recite their list, and the task becomes demanding when they are asked to identify cards out of order;

- more sophisticated learners telling themselves stories about the cards, but they also find it difficult to access knowledge out of sequence.

b) Pattern Recognition Test

The child copies a pattern by placing coloured discs into a 5x5 grid. Each place on the grid is one of four colours or empty.

Only 15 (20%) of the children failed to copy the pattern correctly. However 70 (92%) used coping strategies that demonstrated that they struggled to "see" patterns as a whole and that they needed to literally feel their way around the puzzle in order to know where the next piece needed to be placed. Hence, they were really only seeing one button at a time and used tactile strategies to identify the relative location of each button.

Difficulties noted include:

- inability to process gaps between the buttons, so the sequence of the puzzle was copied but without any gaps, leaving a row of empty spaces at the bottom of the puzzle.

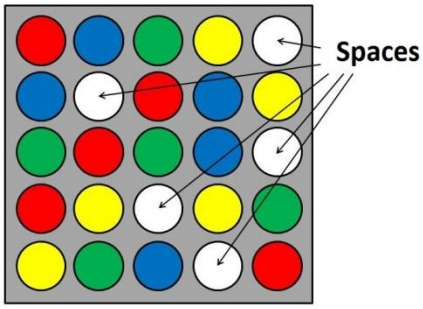


Figure 1 Pattern to be copied

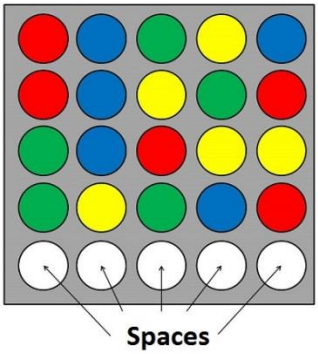


Figure 2 How the child copied the template, ignoring or unable to see the spaces.

Coping strategies included:

a) using a finger to keep place in the puzzle;
b) tapping the puzzle buttons back and forth in order to memorise the relative position of different buttons, sometimes accompanied by repeatedly listing the colours of the buttons;
c) using only one hand and moving the puzzle over to one side of the mid-line;
d) avoiding gaps by changing direction, so the puzzle is completed in a sequence that leaves the most challenging part of the pattern until last which is completed more slowly. The perceived complexity of different parts of the puzzle is determined by the learner's processing skills rather than the actual pattern; different learners have different blind spots.

Conclusions

A. *What are the basic processing difficulties or characteristics common to all learners struggling to cognitively process in a classroom environment?*

1. All the children that the schools considered to be "struggling to learn" are experiencing developmental delays in one or more of the following areas:
   - gross motor skills;
   - mid-line crossing;
   - binocular vision

   However, each child is unique in the combination of factors that appear to be developmentally delayed.
2. These developmental delays impact on the ability to efficiently solve simple problems or develop an effective visual memory.
3. Problems noted include:
   - poor proprioception;
   - poor understanding of laterality and hence, left and right;
   - poor pattern recognition;
   - slow processing speeds in cognitive tasks.
4. Coping strategies do not fundamentally change cognitive skills. They can help get by in the short-term, but in the long-term they leave a child unable to progress steadily with more complex tasks.
5. When assessing the effectiveness of any intervention that is intended to impact on cognitive processing, it is important to understand the subject's control over:
   a. Primary reflexes, mid-line crossing, gross & fine motor skills, and balance;
   b. Auditory processing;
   c. Cognitive visual processing.

   Without this basic knowledge it is hard to assess how effective any intervention might be which is intended to change a child's cognitive skills.

B. *How long does it take to assess a child?*

1. It takes about 20 minutes to carry out the assessment of a child in the 3 development areas. More time is needed for older children in order to explain what is being assessed.
2. The assessment is followed up by a written report which takes about one hour to draft.
3. A further two hours is also needed for debriefing school staff and parents.

   Therefore the total time required for a full assessment and debrief is 3½ hours per child.

C. Could the process be enhanced by using more sophisticated technology?

1. Practitioners of CVIT continuously update their processes. New technology offers opportunities to improve the observation process and data capture, the ability to share information with stakeholders, as well as the therapy itself.
2. Fit 2 Learn is investing in technology to optimise data capture by developing an app which will be used on a mobile device.
3. Video technologies, such as Iris Connect, allow an assessor to review a child's physical actions with:
    a. themselves - to confirm observations and check for anything missed while logging data;
    b. teachers and teaching assistants - to aid training and promote wider understanding;
    c. the child - so that they can "see" what they are doing and better understand how to improve their muscle control etc;
    d. parents - in order to fully explain issues and create shared understanding.

These examples suggest that there is wide scope for using technology to support the whole process.

Fit 2 Learn monitors the market for new affordable technologies that will capture data or assist children in mastering some aspect of cognitive development. Although there is a plethora of new technology, currently very little of it is precise enough for our purposes.

Overall

CVIT has a track record of correcting developmental delay problems using established non-invasive therapies.

These therapies are designed to resolve issues and enable the child to change their cognitive processing skills and speeds.

Given the scale of problems that were uncovered during the assessment process, the pilot studies will proceed in three schools and the results of our intervention will be published in due course.

Appendix A: School Characteristics Contextual Data

School A - Community Primary School with SEN Base

# Pupils on roll	312
Boys	54%
Girls	46%
Pupils with SEN statement or on School Action Plus	12%
Pupils with English not as first language	25%
Pupils eligible for free school meals	52%
OFSTED rating for overall effectiveness	Good

School B - Community Primary School with SEN Base

# Pupils on roll	256
Boys	57%
Girls	43%
Pupils with SEN statement or on School Action Plus	25%
Pupils with English not as first language	25%
Pupils eligible for free school meals	40%
OFSTED rating for overall effectiveness	Good

School C - Academy Converter mainstream Girls Comprehensive School

# Pupils on roll	1282
Boys	1%
Girls	99%
Pupils with SEN statement or on School Action Plus	11%
Pupils with English not as first language	20%
Pupils eligible for free school meals	23%
OFSTED rating for overall effectiveness	Good