

## ❖ KINETOTHERAPY

**EYE-HAND COORDINATION IN SECKEL SYNDROME****BIANCALANA VINCENZO<sup>1</sup>****Abstract**

The article reports a motor experience conducted in a female individual aged 28, affected by Seckel Syndrome, and aimed at improving eye-hand coordination.

The scientific literature reports that, today the Seckel Syndrome is only afflicting about a hundred of people (at least, this is the number of those currently notified) therefore, it is appropriate to define it as a *rare* syndrome.

The work was validated in and out, through the administration of the "MO.V.I.T." test, which stands for "Movement Evaluation Transfer Intervention" and went on for six month.

**Key words:** eye-hand coordination, children

**Introduction**

The Seckel Syndrome is described as a rare syndrome, characterized by physical deformities of primordial dwarfism. Meaning that, intrauterine growth retardation of the fetus, is already highlighted at the earliest stages after conception.

It is also defined as heterogeneous, as each patient so far diagnosed, does not always show all the characteristics that are listed in the description of the syndrome itself. In fact, of the hundred of cases reported since 1960 up until today, less than one third, seems to match the original criterions established by Seckel. This is not due to diagnostic inaccuracy, but to descriptive incompleteness, which is due to the lack of adequate diagnostic instruments and medical history data.

Having said that, it remains unclear which are the real causes of the syndrome, even though, at the moment, all etiological studies agree that it arises from a malformation on a genetic level, on chromosome 3 and 18. In fact, the three most known genes responsible for the syndrome, appear to be SCKL1, 2 and 3, and are actually located on chromosome 3, 18 and 14. (M.O. Kilink et al., 2003)

The only sure thing, is that we are dealing with a disease that is passed on according to an autosomal recessive inheritance, that is, due to a defective gene present on an autosome.

In about 60 cases reported by the scientific literature, it was found that, in some of them, the patients were children of consanguineous parents (first cousins, in most cases). Whereas in other cases, there was evidence of gestational

diabetes developed by the mother during pregnancy.

The main characteristics of this syndrome are: microcephaly (which shows a circumference of the head that corresponds to that of a 1 or 2 years old child), severe mental retardation (with an average IQ around values ranging from 15 to 25 and that, in any case, never exceed 50), psychomotor retardation, lumbar-spine scoliosis, hirsutism, hip dysplasia, proportionate dwarfism (adult height between 100 and 138 centimetres) and clinodactyly of the fingers.

Generally, the individuals who are affected by the Seckel Syndrome are friendly and calm. They show interest in the surrounding environment, and are also attentive to cleanliness and personal hygiene.

**The case study**

D.L. was born in 1981, she is 129 centimetres tall and weighs 32 kgs. Her mother did not have particular problems during pregnancy. D.L. was born on the 37th week of pregnancy (one week after prematurity), but a defect of the intrauterine growth, had already been detected by antenatal screening, suspecting a prenatal infection.

Soon after her birth, she was hospitalized due to her low body weight of 2.3 kgs and from the very first day, she showed little reactivity to stimuli and reduced spontaneous mobility, together with general hypertonia, especially of the lower limbs.

The cytochemical examinations and the culture of CSF (cerebrospinal fluid) turned out to be negative, but ESR (erythrocyte sedimentation rate) showed very high values. In conclusion, such

<sup>1</sup>Università degli Studi di Urbino "Carlo Bo", ITALIA

Email: vincenzo.biancalana@uniurb.it

Received 17.04.2011 / Accepted 24.06.2011

data, together with a positive amniocentesis (as a result of some episodes of influenza occurred during the last trimester of pregnancy), led to diagnose a possible fetal infection.

As D. grew older, all the characteristics of the syndrome were accentuated and obviously still are, like the typical narrow bird-like face, the constant flexion of the knees, significant mobility problems, kyphoscoliosis, clinodactyly, malfunction of the urogenital apparatus and above all that, a severe mental retardation. (Faivre L., et al., 2002)

The psychomotor evaluation of D. has been carried out using the "Mo.V.I.T." test, which was developed by Professor Lucio Cottini in 1996.

### The "Mo.V.I.T." test (Movement Evaluation Transfer Intervention)

The purpose of this test, is to give the operators of the motor activity, a method for setting-out and leading their intervention, which is, at the same time, efficient and meticulous, providing guidance for operational goals, outlining methodological paths for intervention and monitoring the results.

Such curriculum is suitable for both able-bodied individuals and people with disabilities. In details, it provides direction for: assessment, functional diagnosis, and establishes the goals. In addition, it delineates the methodological paths relating to the field of psychomotor.

This instrument is characterized by four main aspects:

- it allows an objective evaluation, which does not take into account the educator's interpretation,
- it represents a guide for observation, which can be led during usual activities performed in the gym,
- it can be used as a checklist, with increased focusing level, which allows you to carry out reconnaissance for those individuals with problems, who show deficiencies at the level of motor skills, through administration of comprehensive checklists,
- it allows, not only the assessment of abilities and difficulties of such individuals, but also their potential development.

As mentioned, the checklist included in the curriculum of the "Mo.V.I.T. test"(Table 1), represents an example of a list, with increased focusing level, which allows the systematic observation of the psychomotor area through seven steps, referred to the functional prerequisites and coordinative skills, here below listed:

- tone and relaxation,
- balance and general dynamic coordination,
- segmental and intersegmental coordination,

- hands coordination, eye-hands coordination and handwriting movement analysis (graphonomics),
- structuring of the sense of space,
- structuring of the sense of time,
- laterality.

For each one of such abilities, except for the laterality one, have been identified six behavioural indicators of progressive complexity, which are then reported in a provided summarizing sheet.

The right-hand side of this sheet, is provided with blanks to be filled with the results of the assessments made. The sheet allows you to compare five different evaluations, performed at different times, in order to check for any improvements made by the individual, in regards to each single case. Each *item* of the summarizing sheets, of the different psychomotor skills, is assessed by five different tests, which do not require a specific arrangement of the situation, since they consist in normal activities performed during a normal motor activity class.

This is why the Mo.V.I.T. tests, does not fall into the danger of artificiality, on the contrary, it allows "*an objective evaluation of the abilities, of deficiencies and of the potential development of the individual, observed in his own environment, free to interact with his classmates*". (L. Cottini).

For the performances of the individuals, for each of the five exercises that evaluates each item of the sheets, it is given a score as follows:

**2 points**, when the assigned task is performed independently, exclusively by voice command.

**1 point**, when the performance is conditional on the help that the teacher introduces, as a result of an initial incorrect performance.

**0 points**, when the assigned work is not carried out at all, despite the help provided by the educator.

The score that the pupil achieves within the five tests of each item, is then added up together and written in the provided spaces of the summarizing sheet, bearing in mind to write down also the date of the assessment.

The interpretation to be given to the scores achieved for the different items, is shown in the table below (Table 1).

First of all we can record the different between the motor abilities. The common and broadly shared concept of ability is a mental representation of its meaning with a large, complex and also ambiguous content. Indeed, we include in it our manual, intellectual, social, communicative, instinctive, sensorimotor, artistic, psychologic skills and abilities. In other words we can add a wide justification of a potential availability to the original concept of ability, which goes from know how to make (implicit) to know how to think, from concrete to abstract, from the instinct to rationality.

If we start from the three fundamental characteristics which describe the motor task, we can classify the abilities in this way: (Table 2)

According to the organizational method of the motor task, we can distinguish:

- discrete abilities
- serial abilities
- continuous abilities

According to the motor and cognitive elements' importance in the execution of the task, we can classify the abilities as:

- motor abilities
- cognitive abilities

According to the level of the predictability of the environment, we can classify the abilities as:

- open ability
- close ability

The six columns of the form, represent the abilities that have been studied by the individual. The six rectangles of each column show instead the items of the summarizing sheet, which will have to be coloured in black. In order to obtain an immediate visual information of the results of the whole evaluation, relative to the psychomotor area, it is possible to report the results obtained, in the summarizing form, attached to the sheets (Table 3).

An important item of this table, which has particular importance, is called *potential development area* or *proximal area* (Table 4).. This notion, which was expressed by Lew Vygotskij around the 1920's, wants to justify that the learning in childhood is the result of a continuous relationship and comparison with other people.

Then, Vygotskij deviates from the *piagetian* concepts that explained a child development done in stages where child was ready for some learning due to the reached maturational stage by child, in order to deepen the dynamic relationships that, according to him, are the only causes that really justify learning development right from the start. These concepts were taken at the beginning of the 80's when cultural psychology became more important in epistemological items inside educational contexts, which stresses the mutual growth between individuals and environments improving the role of social interaction in the knowledge's construction processes which mainly occur in school. In other words, learning is not only the result of a transfer of notion or the simple outcome of an individual acquisition, but rather it's a social construction, because it happens with the use of

some mediators, signs and symbols, or, as Bruner called them, *cultural amplifiers*, including, nowadays, the use of computer. Indeed he declares that the learning is a *in progress* process, based on the elaboration of the information, the adoption of a lot of operational strategies and on the hypothesis test in a contest which cannot detach from participants' collaboration.

Moreover Bruner believes that the adoption of strategy of collective learning would increase the solution of problems, which is due to its possibility that offers a continuous comparison of interpretation of a certain problem. Also I declare that, the collaborative relationship with other persons allows a continues re-description of their own beliefs and knowledge not only in developmental age, that if we observe them in a *other* size, they can have new and different meaning, or they can be increase in their own implicit meaning so they can be used in different context from their specific context of affiliation. For example, if I observe someone who uses the implicit meaning of *roundness* as synonym of perfection in order to describe the completeness of Perugino's picture, with a broad meaning of the same secondary meaning of *roundness as perfection*, I could state that I have drunk a *round wine*. In other words the comparison with other people can give me a continuous possibility for describe many situations that can make me have and use old concepts in a new and different way. So it's not difficult to describe this situation with the term of *learning* which mainly means change. Every time that I learn something from reading, watching a movie or from sensory and motor experiences, I'm not longer what I was before that experience: I mean, that I'm the same person but I have added a new learning. I'm different and changed.

Every learning causes a change and an implied growth.

Of course these statements take a very large virtual meaning if we consider many situations of disabilities which exist. In the case of Seckel Syndrome which we describe, during the learning phase the imitative experiences and educators' contributions are essential for the girl: so Vygotsky's concepts are absolutely right.

The six columns of such form, represent the abilities that have been studied. The six rectangles of each columns show instead the items of the summarizing sheet. Therefore, the Table will be placed as follows:

1. The blank spaces should be coloured, for the items carried out properly by the individual.
2. The blank spaces that represent the area of Potential Development, should be marked by dotted lines.

3. The blank spaces that represent a score that reveals the lack of ability, should be left blank.

Once the score for the different psychomotor skills, has been calculated in its raw pattern, it is necessary to convert such "measurements" into specific prescriptive references.

The score relative to each of the six ranges, has to be then turned into *standard points* or *pondered points*, and expressed on a scale with average 10 and standard deviation 3.

By adding up the *pondered points*, achieved in each of the six scales, one can determine the overall level relative to psychomotor skills, expressed on a standard scale with average 100 and standard deviation 15.

When the score of the pupils is higher than 130, then the level is considered "very high". It is instead considered "high" when the score is between 130 and 116, whereas those students who have achieved a score between 115 and 85, are placed at a "medium" level. Below this threshold, the level is considered "poor" (score up to 70 points) and below that, the level is "very poor".

D.'s evaluation (graph nr. 5) clearly shows that she does not have any item, in which it is possible to assure a complete ability, if anything, it was found that on the 36 items, only in 4 of them, she could achieve a score marked by dotted lines, which indicates the "Potential Development" area.

So, in order to carry out a conclusive work, the Mo.V.I.T. final graph, seemed to us as being reductive, therefore we decided to elaborate another graph, where we could take into consideration only the eye-hand coordination skill. We replaced the six columns, originally assigned to the six different skills, with six specific items for eye-hand coordination, and the six items have then been replaced by five exercises, required for each one of them. Such graph, allowed us to have a clearer view on what her real eye-hand coordination skills are.

The items of the new graph stood for:

**Item 1.** Ability to scrunch up and fold sheets of paper.

**Item 2.** Ability to grasp a pencil with three fingers and draw lines.

**Item 3.** Ability to perform functional activities, which require coordinated movements of the hands.

**Item 4.** Ability to copy shapes and letters.

**Item 5.** Ability to hit targets with a small ball.

**Item 6.** Ability to mimic symmetrical and asymmetrical movements of the hands that require fine coordination.

As shown in graph 6, the patient only reported a *potential development* in the first three

items, considering that, the required score to fill the blank square with dotted lines, was the minimum. In regards to the first three items, D. managed to get some points in the following exercises:

**Item 1.**

● *Exercise 1.* Invite the pupil to scrunch up a sheet of paper and make a ball with it, using both hands, 2 points.

● *Exercise 2.* Invite the pupil to unwrap a candy using both hands, 2 points.

● *Exercise 3.* Request the student to fold a sheet of paper in two parts, 1 point.

● *Exercise 5.* Request the student to fold a sheet of paper twice, in order to get the shape of a small rectangle, 1 point.

**Item 2.**

● *Exercise 2.* Invite the pupil to hold a pencil with three fingers and draw some scribbles, 2 points.

● *Exercise 3.* Ask the student to hold a pencil with three fingers and draw horizontal and vertical lines, 1 point.

● *Exercise 4.* Request the student to hold a pencil with three fingers and draw oblique lines (both single lines and oblique lines in the shape of an "X") 1 point.

**Item 3.**

● *Exercise 1.* Invite the student to pick up ten objects scattered on the ground (5 small objects that can be held in one hand, and 5 bigger objects that need both hands, 2 points).

● *Exercise 2.* Ask the pupil to unscrew and screw the cap of two bottles, 2 points.

From this final assessment, one can notice the remarkable difficulties that the girl found in performing these exercises. As a matter of fact, analyzing the test, it resulted that, there are only four items in which we observed an area of "potential development", three of which referred to the eye-hand coordination skill and one referred to balance.

In addition to this, it emerged a total lack of assimilation of the concepts of *loud/softly* and *near/far*, which interfered with the whole work and that necessitated a special learning training, which was carried out separately.

Those circumstances, brought out the ultimate aim that allowed us to focus on improving the eye-hand coordination. On this purpose, recreational and sport paths have been structured, alternating between bowl game and activity in the gym.

**The training**

For obvious reasons of "space" we will only describe some essential phases of the work,

taking for granted that the whole series of exercises had a wide repertoire, in both methods and contents.

The first period of the activity was addressed, as mentioned above, to adopt the concepts of *loud/softly* and *near/far*, by working on the ground, through the use of balls and other objects of different sizes and weights.

The first results for *loud/softly*, were seen after 4 months of intense work, carried out in the gym, using balls of different sizes and weight and positioning skittles at different distances. At the same time and using the same method, we came across the concepts of *near* and *far*.

At the end of this first set of work, we proceeded performing specific exercises aimed to improve eye-hand coordination. Using the same balls, which D. already got acquainted with, we initially started with a very loose method made of throws, tumbles and catches of the various balls.

Lots of difficulties were encountered at the beginning, just to simply keep the volley ball on the palm of her hand, but after not even a month, she could hold it for more than 10 seconds, and that gave her great satisfaction!

The next stage was to learn to keep the ball on the palm of the hand and, at the same time, extend the arm forward. Such movement is particularly difficult, because the act of extension, automatically starts "*sincinesie*" that affected the voluntary movement.

After this further learning, we passed on to both static and dynamic catch, even though still today, flying catches of the ball remained problematic, especially when using small sized balls. The stage of "throws" has been the most difficult for D. and, in fact, it gave poor results.

The methods used were the following:

- throwing the ball with both hands above her head,
- carry out throws from below, performing first a lunge with the leg ipsilateral to the throwing arm,
  - throwing the ball from below with the opposite hand, from the one generally used,
  - throwing the ball from above (difficult task that rarely responded to the real intentions)
  - performing throws associated to another circuit, such as walking (as much difficult)

The initial phase of this path, performing throws, has been the most critical, as often, the unsure grip of the ball, did not even allow D. to get to the launching position. But, after about a month, she was able to tackle the grip and

throws pattern, 6 or 7 times out of 10 trials.

Following this phase, that was initially performed in the gym, we continued the activity in the *bocciodromo*, which is the area for playing bowls, where the elements of throws have been deepened and contextualized.

So, after 6 months of work, we can say that the results are quite satisfactory.

Looking at the results, on the summarizing sheet of the Mo.V.I.T. test, one can notice improvements, even though there are goals, which have not been completely achieved.

But everything has to be declined to the initial situation of D. that, as we already saw, was very difficult. So, also the expectations, could not go beyond those of an improvement, better than the one we achieved.

As we can see from the final graph, one can notice a little improvement in the V item, where D. succeeded and scored one point in two exercises, that were:

- alternatively hit with one hand and then with the other, a ball that we threw her from a distance of three metres,
- same exercise, but with a side throw.

Since she was given a score of 1 point, means that the desired outcome has occurred at a distance of two metres, instead of three metres.

Ultimately, the fact that D. will still have learned something, gives us hope for her future learnings, meaning that, even the smallest achievements, are the "proof" that, a certain cognitive potential is still available and can be stimulated for future learnings.

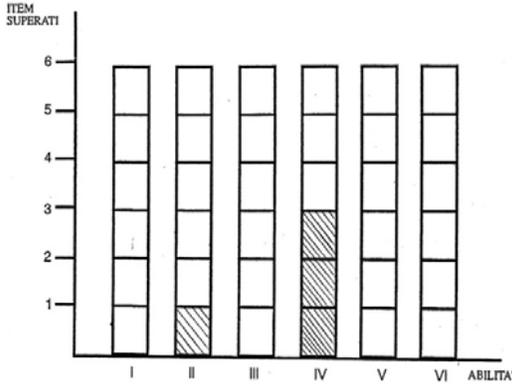
In fact, every little psychomotor learning has, in its basis, a series of activations of the learning processes, such as focused attention and memory, which represent its justification. And, it will be on the awareness of such cognitive "residues" that the adaptive intervention and the construction of new learning processes, should be based on, both in regards to motor skills and self-sufficiency.

## References

- BIANCALANA, V., 2008,** *L'Intervento adattativo*, Ed. NonSoloFitness, Bologna.
- BRUNER, J. S., 1917,** *Studi sullo sviluppo cognitivo*.
- FAIVRE, L., et al., 2002,** *Clinical and genetic heterogeneity of seckel syndrome*, AM J MED Genet.
- KILINK, M.O. et al., 2003,** *Is the novel SCKLÉ at 14q23 the predominant seckel locus?*, EUR J HUM Genet.

**OSSERVAZIONE DELL'AREA PSICOMOTORIA:  
PROSPETTO RIASSUNTIVO**

ALLIEVO: DANIELA ETA': 28 CLASSE: \_\_\_\_\_  
 DATA VALUTAZIONE: 12.11.2008 PUNTEGGIO MEDIO TOTALE: \_\_\_\_\_  
 LATERALITA': Mano Sx Piede Dx Occhio Dx



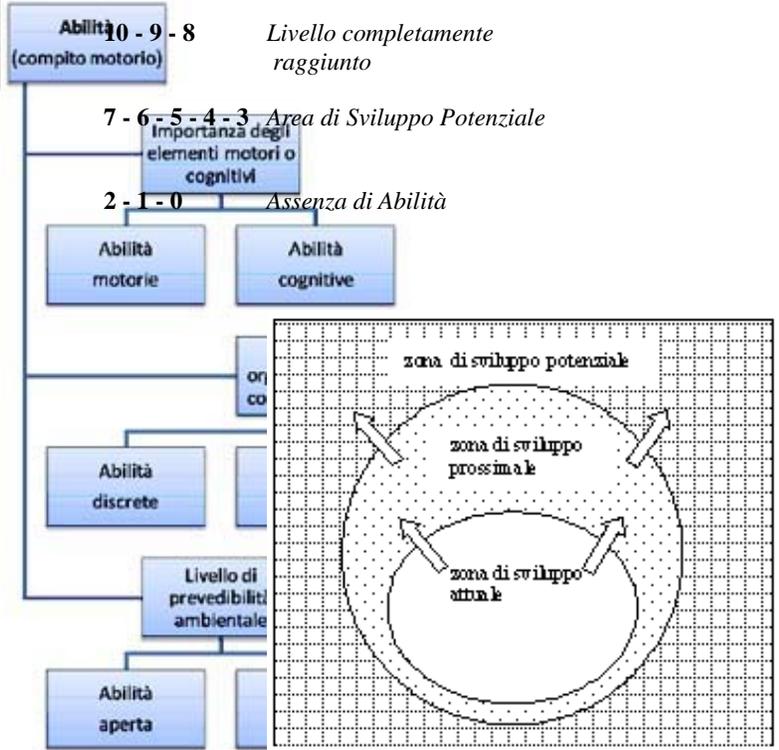
ABILITA'	MODALITA' DI REGISTRAZIONE DEI DATI
I TONO E RILASSAMENTO	p. ___
II EQUILIBRIO E COORDINAZIONE DINAMICA GENERALE	p. ___
III COORDINAZIONE SEGMENTARIA ED INTERSEGMENTARIA	p. ___
IV COORDINAZIONE DELLE MANI, OCULO MANUALE E ABILITA' GRAFO-MOTORIA	p. ___
V STRUTTURAZIONE DELLA NOZIONE DI SPAZIO	p. ___
VI STRUTTURAZIONE DELLA NOZIONE DI TEMPO	p. ___

Livello completamente raggiunto  
 Area di sviluppo potenziale  
 Assenza di abilità

Prospetto riassuntivo della valutazione

**Punteggio**

**Livello di Padronanza delle Abilità**



5-5	4-4	3-3	2-2	1-1	
1	0	0	0	0	
0	1	0	0	0	
1	1	0	0	0	
2	2	2	0	1	
2	0	2	0	1	
I	II	III	IV	V	VI