JUGGLING AS A METAPHOR FOR LEARNING

CAN LEARNING TO JUGGLE HELP TO DEVELOP THE TOOLS FOR FORMAL LEARNING?

BY: LIONEL CHANARIN

I, Lionel Chanarin hereby submit the following dissertation. I declare that this is my own and original work and that any quotes, data or ideas taken from other sources are clearly marked and referenced as such. I understand that plagiarism is a serious offence.

Date: 28/09/09

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1. MOTIVATION AND QUESTIONS (abstract)

The topic of this dissertation is quite close to my heart. I’ve practiced and enjoyed juggling, performing professional juggling acts and teaching juggling to children and adults for many years.

Now, having undertaken a four year study in education, my interest has been sparked as to the theoretical implications and practical applications of learning through movement, and a desire has risen in me to explore juggling as a tool in this respect.

In order to present my research in a coherent manner I will first give a general introduction to my history, the history of juggling and the ‘art’s’ status in modern medicine and education.

In the following chapter and subchapters I will attempt to show, according to modern therapists and educationalists, what the foundations for formal learning (reading, writing and arithmetic) may be. I will also show how learning and brain-interactive functions are developed from a neuroscientific standpoint. It will become clear to the reader how juggling or learning to juggle may affect these areas in a positive and possibly therapeutic way.

In an attempt to validate this research I performed a case study with a class of 28 Class 3 children at the Constantia Waldorf School. I administered a series of tests to establish their development in the various areas described as foundations for learning. I wanted to establish whether learning to juggle could help develop these areas.
The process and exercises that I went through with the children over three weeks will be described in detail with diagrams to give clarity.

After teaching the children to juggle I performed the diagnostic tests again to see whether I could observe any changes in the development of their learning foundation skills.

Following that is a general report on my findings and a few exceptional cases that I felt required special recognition.

My main question and reason for this dissertation is to establish whether juggling has a value in education and to what extent that value may be beneficial in education, therapy and general life.

My conclusion contains my possible answers to this question after completing the research which is followed by my personal final remarks.
2. INTRODUCTION

I learned to juggle at the age of seven when I first entered primary school. My teacher at the time, Michael Barta, was a juggler who saw something more than the purely performance side to the art of juggling. In subsequent years I have spoken to him on the subject. He said something to me once that I have been tossing around in my mind ever since. He said, “Juggling is a metaphor for learning.” I find this analogy to be true on many levels. Firstly, is the idea that juggling can equip children with the tools to learn and secondly, it can help to remove hindrances to learning. Thirdly there is the therapeutic potential of juggling.

The ancient art of juggling has been a custom in numerous primitive cultures from all corners of the earth. We find illustrations, sculptures and writings documenting the art of juggling in the ancient civilizations of China, Egypt, Greece and the Byzantine and Roman empires (Mendner, 1956). Yet only in exceptional cases do we find any reference to the healing powers of juggling as for example, the recommendation of Aurelianus in the 5th Century, that ball games are beneficial to epileptic children. It is not until the modern age that medical professionals and educationalists are starting to tap the therapeutic potential of juggling. The list of symptoms that are now being treated through this means range from a wide range of learning difficulties at school to mental retardation, paralysis and hemiplegia (one-sided paralysis after a stroke) to list but a few. I do not want to, and am not qualified to, go too deeply into the therapeutic aspects of juggling, in this short dissertation.
I would like to start by looking at the words “tools for learning”. Education rests on the development of faculty, which is the child's inherent ability to develop the capacities and skills needed for learning (McAllen, 2004). As a teacher one is pleased when neat and original work is handed in. When messy, unoriginal work is done we must ask ourselves two questions: is the subject matter meeting the child or has the child developed the capacities or tools that form the foundation for reading, writing and mathematics? What are these skills and how can we help to develop them? The key is movement. Neuroscientific research is showing that ever more complex movements are the fertile ground for the growing and developing brain (Hannaford, 2005). A study was conducted in Germany using a functional MRI to determine whether the structure of the brain can change as a result of learning a complex skill. Scans revealed that subjects who learned how to juggle showed an enlargement or growth of the cerebral cortex where higher thought processes appear to be handled. Previous studies have shown that learning can result in changes in the brain activity, but this study went further to demonstrate anatomical change- an increase of grey matter- as a result of learning to juggle (Draganski B, et al. 2004:311-312).
3. FROM INTERVIEW WITH MICHAEL BARTA

Michael Barta was my primary school teacher, a highly motivated and inspired man. I was very privileged to be a part of one of the classes that he took right through primary school, from Class 1 to Class 7 (7 years to 13 years). He taught our entire class to juggle. I remember my fascination when he came to meet us in kindergarten, this big man with a beard. There was something mystical about him, but unlike most magicians and wizards, he had an “open secret”: he desperately wanted to share his magic with us. From the very first time he took three stones and magically brought them to life in a “living” geometry, a moving, visible rhythm – we were hooked. It was as though the secrets of the whole universe could be discovered through this magical art. I mean this literally, and wish to express it through a poem by Michael Gelp and Tony Buzan, from their book The Art of Juggling.
Deeply
I am a juggler
Deeply
I breathe out into the universe
I have breathed in
Into the universe
Where suns
Juggle planets;
Where galaxies
Juggle
Suns and their systems
Where the masked juggler
Juggles
These ten-to-the-ten of the
Starry ten-to-the-ten
Constantly
Immaculately
Eternally
I, atomic child
Charmed child
Of the universe
Juggle
And, am, juggled
Michael Barta believes, as do anthroposophists (practitioners of R. Steiner’s spiritual science), that the human being expresses a three-foldness: thinking (our head organisation and nerve-sense system where we are awake); feeling (our rhythmic system, heart, circulation and lungs, where we are in a dreamy state) and willing (our metabolic limb system, where we are asleep).

Through our thinking we are connected to the universal spiritual, through our willing we are connected to the physical and material, and our feelings lie between the two as a mediator representing the soul (psyche). Michael Barta, in his article ‘Carving space with visible rhythms’ (Barta, 1998), speaks of how, through developing juggling skills, we make use of these different “modes” of our being by practicing a visualisation technique; columns, cascades and shower patterns manifest in the juggler’s mind. He poises himself in a relaxed, upright position, with calm, rhythmic breathing, as if in a meditation. He materialises these forms. His unconscious willing is able, through practice, to act effectively on his surroundings. The juggler stands between two opposing forces - gravity (which exerts downward), and levity (which streams upwards) – and brings them into equilibrium. He controls six directions: up and down, left and right, and forwards and backwards.

Michael Barta, as do I, sees juggling as a metaphor for learning. Barta explained that with juggling, “Achievements and mistakes are known instantaneously, and success is born out of failure” (Barta, 2004). Our modern culture often, wrongly in my opinion, judges failure as inferiority: we are taught to fear failure. The juggler knows that the dropped ball is a step towards success later on. Hundreds and thousands of throws, bringing the will (his actions and movements) into consciousness, until
finally the epiphany (as I call it), a surprise moment, he witnesses and experiences the magical, living, moving “mandala” that he, out of his own failure and perseverance, has created. His mind and thinking, flexible enough to “juggle” (both figuratively and literally) a number of thoughts and actions simultaneously. As Barta says, “the resulting transformation in the child’s way of thinking can help them deal with challenges and adversity” (2004). He tells of how he has seen children grow in confidence as they, step-by-step, overcome obstacles and “harmonious rhythm develops in them”.
4. THEORETICAL UNDERPINNINGS

THE FOUNDATIONS FOR LEARNING

In order to investigate what effect, and to what extent, juggling - or learning to juggle – has on children’s learning, I had to establish what the foundations of learning are – both emotionally and developmentally. Movement is the key. From the very first movements in the womb, a child is laying the foundation for future learning. At first, these movements are reflexes, but as the child grows, the movements become more refined; grasping, holding and placing. The child learns to walk and become a free, moving, talking, touching being, at home in their body. Now these movements must be refined to a much higher degree in order to write, read and work with mathematics.

The main steps that lead to spatial orientation, the ability to stand upright, move freely and feel at home in both body and space, begin in infancy. The first step is “creeping”, where the child lies on their stomach, reaches forward with one hand, while simultaneously pressing against the floor with the opposite foot to move forwards, and then repeating it with the other sides of the body. Barnard refers to this as reciprocal bilateral integration (2009). Then they rise up onto hands and knees, and “crawl” about. In the first, he stretches into space and gravity, in the second, added to the first, he raises himself into levity. According to McAllen (2004: 13) this is “necessary to complete the full integration of the central nervous system, which reflects to us our spatial and bodily awareness”. The child then stands upright, and then gradually begins to walk. At this stage, the child uses his left and right sides indiscriminately. The child goes through an ambidextrous stage. It is as though there is a wall between the left and right sides of the body. A child at this stage can
be observed passing a crayon from left to right hand, because, although they may be physically able, it seems as though they unconsciously avoid crossing the midline to pick up a crayon with the right hand from the left of their body. McAllen (2004: 13) calls this the “vertical midline barrier”. This calls both hands into movement, each on its own side, thus activating both brain hemispheres. At a certain point, this two-sided symmetry loses its usefulness. The child should be encouraged to choose a side. Unconfirmed sidedness, or “cross-dominance” can inhibit learning faculties (McAllen 2004: 13). Dominance is usually attained between six and seven years of age. It involves the limbs, eyes and ears. In order for dominance to occur, the vertical midline barrier must be integrated. Once this happens, the child can use both hemispheres of the brain according to the particular kind of occupation, Barnard (2009) refers to this as asymmetrical bilateral integration. Hence, the child can concentrate for longer, imagination in connection with language develops, and true social play begins (McAllen 2004: 14). Dominance usually develops naturally, but careless handling, subtle structural misalignments because of mild injury, or over-stimulation can cause a cross-dominance e.g. right-hand, left-eye. Mixed or cross-dominance can often lead to difficulties with reading and writing (McAllen 2004: 35). It is, however, possible to help children integrate their midline barrier and develop a healthy dominance through specific exercises. This finding added inspiration for my aim to research juggling as useful tool in this respect. Bilateral integration develops as the vertical midline is crossed more freely; dominance can then be fully established. The two hands are gradually able to move and perform independently of, yet integrated with each other. This invisible vertical midline barrier divides the body into right and left. This is present in order that the young child develops and
strengthens both sides of the body. By the age of seven, this barrier should have disappeared.

When the barrier is retained in the school-aged child, he often has trouble with writing: the right-handed child will place his book or paper at the far-right corner of the desk to keep in the right of the midline. He may twist or lean his trunk, or turn himself in his chair to sit sideways in his desk, or turn his paper – all to avoid working on or across the midline (Barnard, 2009).

Reading is also often a problem when the vertical midline is retained: the eyes have to keep crossing the midline. Often, the child will lose his place, blink involuntarily or jerk as their eyes cross the midline.

Children who do not easily cross the midline often have problems with carrying and borrowing in addition and subtraction respectively. They often have trouble keeping columns straight when doing long-division, for example (McAllen, 2004).

Eye movement plays a big role in learning. Eye problems are common among children who have not yet integrated the vertical midline barrier, although this may be caused by muscular imbalances in the fine muscles of the eyes. Eye muscle difficulties may be caused by vestibular problems. Often, a child with poor muscle control in the eyes will move the head or body rather than isolating the eye movements. Any of these problems can affect the learning of reading and writing (McAllen 2004: 72). My research addresses the ways in which juggling helps strengthen the eye muscles, improve hand-eye co-ordination, and improve the midline eye movements.
ON A NEUROLOGICAL LEVEL

Our mind, our thoughts and our reality, the unfathomable potentiality of the human being baffles us on our quest to understand ourselves. In recent decades, possibly centuries, a lot of attention has been placed on the study of the brain in order to understand the mind. However, it is becoming clearer and clearer that learning, thought, creativity and intelligence are not process of the brain alone, but of the whole body (see Hanneford, 2005). Sensations, movements, emotions and brain interactive functions are grounded in the body. All these qualities, which we consider to be human, are associated with the whole body and mind. As we grow and move, experience the world and ourselves, our nervous system is dynamically changing and reorganising. Our neural wiring develops in direct response to this. According to Hanneford (2005: 21), “Neural plasticity is an intrinsic beneficial characteristic of the nervous system that gives us the ability to learn, and the ability to adapt in response to danger – to relearn ... Ability and increased potential grow hand in hand.” In other words, what Hanneford is saying is that as we grow, move, learn and experience the world, neural pathways are created and adapted in more and more complex patterns. These patterns allow us to receive stimuli from the outside world and perform the juggling act of life.

As we experience sensation and initiate movement our neurons form extensions called dendrites, which bring one nerve cell into communication with another. As the movements become more complex, these dendritic extensions form neural pathways, which through use and development of complexity become, what Hanneford (2005: 23 ) refers to as “superhighways”. This, in reality, is learning and thought. With the
development of a skill, like all learning, through our senses, emotions and movements, we form a base network. With practice, this basal network is developed and the skill is enriched, becoming more and more complex, increasing our understanding and abilities.
5. DIAGNOSTIC TESTS

I first performed a series of individual diagnostic, or assessment, tests with 28 Class 3 children at the Constantia Waldorf School before teaching them all to juggle. These tests were done individually or in pairs and took approximately 10 minutes each. We then practiced juggling for 30 minutes, five days a week for three weeks. After teaching them to juggle, I repeated the diagnostic tests to establish if, and to what extent, juggling had assisted in developing the skills needed for learning. I documented the tests as they were being carried out, making short comments about difficulties or barriers, inconsistencies, abilities and anything else that I felt was not a normal, healthy developmental stage. Where the children performed the task with ease and with technical competency, I simply put a tick (see example of diagnostic test in appendix). The tests were aimed at establishing the children’s development of the following essential developmental abilities: dominance, the midline barriers, bilateral integration, perceptual motor skills, spatial awareness/orientation, hand-eye-speech co-ordination, sensory integration and rhythm.

DOMINANCE

Dominance is the use of one side of the body in preference to the other. Most of us are right-sided. Dominance determines preference of hand, eye, ear and leg use. After the ambidextrous stage (see Chapter on the foundations for learning), dominance occurs naturally. However, minor injury, careless handling, subtle structural misalignments or over stimulation of the sensory organism may cause variants in this normal,
natural dominance (McAllen 2004: 35). Mixed or cross-dominance are often found in association with reading or writing difficulties (McAllen 2005: 35). To check the dominance, I offered the child a paper telescope, taking note of which hand they grasped it with. Using an imaginary story, I told them to look through the telescope at a small toy bear on the end of my pencil, and follow it as it moved. I observed and noted which eye they put the telescope to, whether they changed hand or eye, what the other eye was doing in the process (scrunched, closed, open). Does the child hesitate in deciding which hand or eye to use? Do they hold they telescope in between their eyes, above the nose? This would imply that they have no awareness of the independence of the eyes. For ear dominance, I asked the children to put their ear to the desk and listen for how many times I tapped under the desk. I repeated this a few times in each case. Some children may have intermittent hearing because of allergies or inflammations (McAllen 2005: 38). Although therapy for hearing problems has little relationship to juggling, it does give an idea of the dominance patterns in a child. For leg dominance, I asked the child to stand straight up with their feet together, and then to take one large step forward. They were also asked to choose a leg which they felt most comfortable balancing on (this also served to establish balance or vestibular problems). If there is a cross, or unconfirmed leg dominance, it shows that the above and below midline may not be sufficiently integrated (McAllen 2005: 73).

**MIDLINE BARRIERS**

The horizontal midline barrier should disappear by age four (McAllen 2004: 69). We can see whether there is retention of this barrier if a child squats to pick something up, instead of bending at the waist. A child who
has retained their horizontal midline barrier will have trouble with their body geography, isolating body parts below the waist, his leg movements may be awkward, and there may be a “tendency of having flat feet” (McAllen 2004: 69). Retention of this barrier does not always interfere with regular school work, but will affect the child’s sport, games, gymnastics or dance. In my diagnostic tests the children were asked to do a series of above and below the horizontal midline body geography movements, first while watching and listening, imitating my movements, then repeating the sequence from memory. I watched the ease with which they moved, the ability to locate certain body parts and whether they could distinguish right from left. The under the legs juggling exercises gave me clues as to the integration of this invisible barrier.

The vertical midline barrier should have disappeared by the age of seven. Retention of this invisible barrier is often associated with reading, writing and arithmetic problems.

Vertical midline barrier retention can be observed in the eye movements. I did a series of eye movement tests; the children were asked to follow the tip of a pencil with their eyes only. I moved the pencil from left to right, up and down, in a lazy eight and forwards and backward (convergence). I took note of excessive blinking, jumping, losing the object they are tracking, watering, pauses, head or body movement. Any difficulties in these areas can affect reading and hand-eye co-ordination in writing. The vertical midline barrier can also be seen in the arm movements: does the child pick something up with the left hand, and pass it to the right, or can they reach across with the right hand? Once the vertical midline barrier is crossed freely, bilateral integration develops.
BILATERAL INTEGRATION

Can each hand perform its task independently, yet integrated with each other? For example, holding a loaf of bread with the left hand, and cutting a slice with the right? In my diagnostic tests, I gave the children a series of simple juggling exercises: the rainbow throw (from one hand in a parabola to the other); under the leg to the other hand in both directions (this was also to observe above and below integration); “tick-tack” (alternating hands throwing straight up) and “two ball cascade” (see diagrams). These exercises bring the hands (and legs) out of gravity in a rhythmical way, requiring bilateral integration, as well as spatial awareness and hand-eye co-ordination, balance and sequencing. Often in these exercises each hand must perform independent tasks, one catching, the other throwing or passing across while the first ball is in the air. The children’s abilities in this respect gave me clues as to their bilateral integration.

PERCEPTUAL MOTOR SKILLS

Marian Jenks Wirth (1976: 8) speaks of three main areas of perceptual motor skills

- Intellectual: one gains first-hand experiences of physics and the environment, size, shape, colour, weight. We develop concepts of time and space, distance and speed (including now, then, fast, slow, first, second and third etc.) and the knowledge of the language of place and position.
- Physical: perceptual motor skills develop a body that is working at peak efficiency, “a body can move when, where and how the situation requires; a body that will not tire easily; a body whose
sensory organs are working with efficiency and depth, and which are able to give accurate and relevant information to the brain” (Wirth 1976: 8). It is as though the reflexive, automatic control of the body is given into the capable hands of the individual, to control the body in freedom.

- Psychological: this is about the child’s confidence in himself as an individual, independent person. After solving the puzzle (juggling a complex pattern) he acquires increased confidence in his own abilities and problem-solving powers. Visualising a problem, formulating a plan and carrying it out.

All of the diagnostic tests gave me clues as to their development in the field of perceptual motor skills.

**SPATIAL AWARENESS/ORIENTATION**

A child, if given time and space, will naturally develop a spatial awareness. They will be able to make an inner, imaginary picture of what or where to move and then, through their will activity, materialise the movement outwardly in space. Before a child can perform the task of writing, which uses two forms – the curve and the straight line – the child must be able to create an inner picture of these forms and move them. Only then can the refined, hand-eye and fine motor movements be developed. If we skip these inner awareness developments, and move directly to “mere outward cognitive-based action” (Wortham and Hunt 1990: 15) then we are retarding the child’s inner awareness of himself in space. Direction, spatial awareness and sequencing are linked. Children with trouble in these areas will often turn their letters around, reverse the words, or confuse the usual flow of a sentence. There are often difficulties with number work, times-tables and arithmetic.
In my diagnostic tests, I asked the children to do a series of visual and/or auditory sequencing movements, first saying and doing these with me and then doing them on their own from memory and the ability to inwardly picture the movements and carry them out.

With all of the motor skills tests, spatial awareness was a major component; how do the children imagine the patterns and then manifest them in three-dimensional space? The children were also asked to do writing and form drawing exercises; these clearly showed their abilities in respect to spatial awareness/orientation.

**HAND-EYE-SPEECH CO-ORDINATION**

From early in the child’s life, lying on his back in the cot, his sensory organs are reaching out and exploring the world around him. He hears his mother coming; he sees her and reaches out to touch what he sees. These are the beginnings of hand-eye co-ordination. It incorporates the integration of many skills; spatial awareness and co-ordination of limbs to start with, later – when the child must write and draw – refined hand-eye co-ordination must be achieved in an integrated way with other skills. He must use his dominant hand to hold a pen, inwardly picture what he is going to do, spatially align where to start writing, on the left of his midline, on the page next to the margin at the top corner. He must then, using finely developed motor skills, shape his letters and words in sequence and direction, all this time co-ordinating his eyes and hands in perfect harmony. My eye movement and perceptual motor skills tests gave clues as to both the development and abilities of the children in this respect. Their writing and form drawing also gave clues as to their hand eye co-ordination. In one of my diagnostic tests the children were asked to speak a times table while doing a rhythmic movement, passing a
juggling ball under the legs from hand to hand. This exercise gave clear signs as to their hand-eye-speech co-ordination.

**SENSORY INTEGRATION**

The term “sensory integration” (SI), used by Kranowitz (1998), refers to the normal neurological process of taking in information from one’s body and environment through the senses, organising and unifying this information, and using it to plan and execute adaptive responses to different challenges in order to learn and function smoothly in life. Kranowitz (1998: 3) also speaks of “sensory integration dysfunction” (SID), which is the ineffective neurological processing of information received through the senses, causing problems with learning, development and behaviour. SID is not classified as a learning disability although many of the symptoms are common with ADHD and ADD. Kranowitz says that SID can be helped through therapy that focuses on sensory integration and recreational activities that strengthen basic sensory and motor skills (1998: 20).

**RHYTHM**

So many children have trouble with timing and rhythm. Rhythm is a basic pre-learning skill. A child who reads with a monotonous, arrhythmical tone often fails to assimilate what he has read (Wortham and Hunt, 1990). Arrhythmic or un-rhythmical speech or movement, pausing, holding breath, jolted speech and movements and hurried movements are symptoms of anxieties and a feeling of pressure.
Children who are very tense often have rhythmical problems. The basic juggling tests that I performed with the children revealed their development in this area. Juggling is a highly rhythmical activity, where the children can relax and have fun practicing this skill. It would seem that the basis of writing is good hand-eye co-ordination arising from “rhythmically integrated movements” (McAllen 2004: 27). In my diagnostic tests rhythm was a major consideration for my observations and anxieties and rhythmic problems were easily diagnosed by observing tension in the shoulders, neck and jaw, also in the grip on the juggling ball; some children held so tightly that throwing was a problem.
6. LEARNING TO JUGGLE

After performing the primary diagnostic tests, I spent fifteen days teaching and practising the following juggling exercises for half an hour every day. We practice these exercises in the rhythmic component of the main lesson\(^1\) as not to interrupt the normal routine of the school day. Each juggling lesson was carried out in an imaginative way involving the whole class and their teacher. The exercises are different from the diagnostic tests (although similarities may be found) but aimed at developing the foundations for learning through juggling.

1. Circle passing

- With the whole class standing in a circle, right hands facing up to receive, left hand facing down to pass, a rhythm is established. (Clap, open, clap, open). One ball is introduced and passed from right hand into the left and on to the next person while maintaining the rhythm.

- Another ball (or two) is added. Now the children must be ready to receive the next ball, this requires and awareness of where the various balls are as they move around the circle.

- Now, on the rhythm, I continuously feed juggling balls into the circle until every child has one. The children are now required to give and receive simultaneously while keeping the rhythm. I

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\(^1\) the main lesson, a feature of Waldorf education, usually takes place for the first 2 hours of the day and focuses on one subject for 3 weeks, the rhythmic component of the main lesson is usually 40 min. at the start of the main lesson in which singing, verses, mental mathematics, and other movement based and rhythmical activities are practised in Waldorf schools.
introduce a song to help keep the rhythm and integrate hand-eye-speech co-ordination.

• This exercise is adapted for practicing ladders and times tables.

• I also introduce above and below integration, stepping anti-clockwise while passing clockwise.

• We pass in front, behind, under right leg, under left leg, over the head while maintaining the rhythm.

2. Balancing

• From the circle passing we balance the juggling ball on our heads.

• We walk forwards, backwards, sideways cross-over step.

• We sit down, lie down on our backs and stomachs.

• Drop the ball off the head and catch it in front and behind.

3. Solo Juggling

• Drop catches
• Figure-eight throws: this is my preference to rainbow throws. However, we did practice rainbow throws. Throwing from the bellybutton to the outside, across the mid-line, each ball must reach just above eye-level. Relaxed and rhythmical throwing and catching should be achieved without reaching up, forwards or backwards to catch.

• Figure-eight under the legs, throwing upwards under a raised leg, attempting not to bend at the waist and without losing balance.
• Behind the back: this throw requires a relaxed grip, throwing the ball over the opposite shoulder from behind the back, alternating sides in a rhythmical and flowing manner.

• Throwing straight up, clapping once then catching. (Introducing more and more claps).

• Pirouette: Step one – throw the juggling ball straight up and ‘spot’ the highest point of its path. Step two – Spin quickly and accurately on the spot. Step three – spot the ball and catch.
• Two Balls: ‘Tick-tock’; we first practice throwing straight up and catching, alternating left and right hands. We then speed up rhythmically – when the first ball starts to drop, throw the next. When that one starts to drop, throw the first again, making sure to maintain the rhythm and look at each ball.

• Around the World: Throw a ‘rainbow throw’ with the right hand, as it reaches its peak, pass the second ball from the left to the right hand then catch the ‘rainbow throw’ with the left hand. Reverse direction.

• Two-Ball Cascade: This manoeuvre is a development of the figure-eight throw. Starting with the right hand throw from the bellybutton
across the mid-line to just above eye-level. When the first ball reaches its peak, throw the second ball across in a mirrored pattern. A steady rhythm of ‘throw-throw, catch-catch’ or ‘1,2,3,4’ will help. Care must be taken not to reach up, forwards or backwards and to alternate the starting hand.

- Three-ball Cascade: As with the two-ball cascade, only now the pattern continues without the need to stop. A flowing, rhythmical pattern should emerge. Care should be taken to spot each ball as it reaches its peak, to throw from inside to outside and to start with the hand that is holding two balls.
4. Partner Juggling

- Buddy Juggling: As with three-balls cascade, only now, one person plays the left hand and the other, the right. The aim is to keep the rhythm with a partner.

![Diagram of Buddy Juggling]

- Partners Opposite: As with buddy juggling, only now the partners are facing each other, approximately a metre apart.

![Diagram of Partners Opposite Juggling]

5. Group Juggling

- Roundabout': This is essentially the same as partner juggling; only now the ‘middle-man’ moves around the circle from one partner to the next. The ‘middle-man’ starts with two balls, throws to the first person, when that ball is halfway to them, they throw to the ‘middle-man’, when that ball is halfway to the ‘middle-man’ he
throws to the next person in the circle. And so it continues. It is important to make a good throw before worrying about your catch.

- Five Pointed Star: The pattern moves from head to foot, foot to opposite hand, hand to second hand, second hand to second foot and back to the head of the star. As with partner juggling, whoever has two balls must throw first, when that ball is halfway to its target the next person throws before catching. A steady rhythm and high arched throws must be maintained.

- Advanced Alternative Stars: This can only be performed with an odd number of participants and follows the same pattern as the five pointed star.
7. REPORTS

PRIVACY AND PERMISSION

Before undertaking this research I acquired written permission from the College of Teachers at the Constantia Waldorf School, the class teacher and the parents/guardians of the children. The names however have been changed as to protect the privacy of individuals.

THREATS TO VALIDITY

In my observations and tests I attempted to remain objective without comparing one child to another. I attempted to reserve my bias as to favourable results and made concise comments and observations based on what I perceived not on what I expected or hoped to see. When doing the second diagnostic tests I purposefully did not refer to the original tests in order that my observations would not be influenced by the original diagnosis. It is also important to note that the changes from the first to second diagnostic test may have been caused by other influence and not from juggling at all. However I feel that this is unlikely because the children were involved in the intensive juggling program and where not, as far as I know (besides some children attending occupational therapy), attending any other intensive development workshops. The analysis of the diagnostic tests was carried out with the guidance of an occupational therapist.

GENERAL REPORT AND FINDINGS

This report on my findings is based on my observations in the first individual diagnostic and assessment tests compared to my
observations in the second, after the three week intensive juggling programme (see Appendix).

The 28 subjects of the study are of mixed abilities and come from varied backgrounds. However, common symptoms and developments in abilities and skills could be seen to varying degrees depending on their individual circumstance and the focus with which they participated in the juggling lessons.

In this report I will look at each foundation skill or development separately, although it should be kept in mind that they are often linked (eg. Midline barriers and bilateral integration go hand-in-hand).

**Dominance:** All of the children who had a uniform dominance, either right or left, showed no change. There were many children who seemed to show signs of unconfirmed or cross-dominance (approximately 1/3 of the class) in the first assessment test. The majority of these (cross-dominance children) seemed more confident in their sidedness, particularly in their choice of hand and eye and their choices reflected a generally uniform dominance.

**Horizontal Midline Barrier (HMB):** My original observations in the first tests seemed to indicate that a few of the children had retained their HMB. They struggled to lift their legs in order to throw under them, had difficulty isolating and co-ordinating their legs with their hands and seemed awkward in their movements. In every case this had improved if not disappeared altogether, in the second set of tests.

**Vertical Midline Barrier (VMB):** The eye movement tests were a very useful method of observing possible VMB retention. In the first tests there were a few children whose eyes jumped when crossing the midline and could not follow the lazy eight. This made it difficult to impossible for
them to achieve some of the juggling exercises. Tracking would be lost on the rainbow throw and the two ball cascade was extremely challenging. This seemed common among children with unconfirmed dominance and poor bilateral integration.

In the second test every one of the children showed vast improvements: most had managed to integrate the VMB with ease, were able to perform the eye movement tests without jumping and could juggle with ease.

**Bilateral Integration:** Many of the children displayed good bilateral integration. However, those with retained VMBs and dominance issues seemed to have difficulties in this area. There were a few children who, even though they had integrated the midline barriers and had a uniform dominance, struggled with some of the juggling exercises. This was visible in their inability to co-ordinate which hand was catching and which was throwing.

In the second tests these symptoms had, for the most part, disappeared and the throws and catches were performed with relative ease, most with confidence and complete competence.

**Perceptual Motor Skills (PMS):** I observed vast improvements in the PMS of every child in this study. The results seem quite remarkable. Intellectually the children seemed to grasp and understand the principles of the forms and movements required. Physically, even the weakest children managed to control and move their bodies in ever more complex and integrated actions and tasks. Psychologically, they seemed to demonstrate a sense of achievement, determination and excitement. They developed an amazing rapport with each other when doing group or partner work, helping and assisting the weaker jugglers and giving encouragement to those struggling.
**Spatial Awareness:** I observed huge improvements in the area of spatial awareness. Every child who showed difficulties in the first visual-auditory tests had noticeably improved in the second test after learning to juggle. The juggling exercises in the assessment tests also showed that the children were now able to clearly picture the forms of the movements and carry them out with ease. Without exception, every child was able to inwardly picture the forms and carry them out accurately by the second test. In the writing tests there were a few children who reversed letters and numbers. I was ecstatic, when I reviewed the second tests, to find that all of those children had corrected their reversals (see appendix). The flow forms gave evidence that children with apparent poor spatial awareness had gained in confidence and ability. In some cases, the forms went from being a jumbled mess to clear and accurate (see appendix). In other cases slight misalignments and inconsistencies became perfectly accurate, beautiful forms. Without exception, I observed advancements in the spatial awareness and orientation abilities. A very pleasing result.

**Hand-Eye-Speech Coordination (H.E.S):** In my analysis of the second tests, I observed that the children who had difficulty coordinating their speech with movements could now speak and move rhythmically and accurately. The content of the speech was a factor, counting ‘1, 2, 3, 4’ could now be performed with ease whereas before, the form was lost with preoccupation with the counting, or the counting was lost because of preoccupation with the movements. When counting the ladders - ‘2, 4, 6, 8’, - some children still struggled to maintain the rhythm. However, my suspicion is that they did not know the ladder by heart.

The eye movements and strength play a large roll in hand-eye coordination. I observed remarkable improvements in this field. A large
majority of the children had one or another apparent problem with their eye movements; some jumping, watering, losing their tracking, experiencing pain, moving the head or body instead of the eyes, stuttering or shuddering or weak, slow or delayed movements. I am pleased to report that these symptoms almost all completely disappeared. Some children with very weak eyes still retained slight problems.

**Rhythm:** When conducting the first assessment tests I observed many children reaching up to catch, possibly displaying an anxiety. Other children held onto the juggling balls very tightly, also displaying an apparent anxiety or tension. I also observed many children showing signs of tension in their shoulders, jaws and arms. For the most part, these symptoms had dissipated and relaxed rhythmical movement could be observed in the second assessment test. Their apparent improvement of rhythmically integrated movement seemed to assist the development of the previously mentioned developmental areas.

**Writing and Numbers:** My observations in this field have been mentioned in some of the aforementioned developmental areas. However, I can report that, for the most part, children whose spacing had been either sparse or compressed now produced uniformly spaced lettering. Children whose writing had progressively diminished in size towards the end of a line (a seemingly common symptom) now had evenly sized writing across the line. My findings concerning the numbering revealed an extraordinary result. All children who reversed numbers had, after three weeks of learning to juggle, corrected every reversal.
Flow Forms: I believe that it is due to the positive influence of learning to juggle and its' effect on the foundations for learning that I observed immense improvements in the forms, their spacing and their overall presentation.

EXCEPTIONAL REPORTS

Gabi

Gabi is right-dominant, yet, in the first diagnostic test, had not integrated bilaterally. She seemed to retain her vertical midline barrier. This was evident in her eye movement test: not only were her eye movements slow and weak, hurting on the convergence, but she could not follow the lazy eight. Every time it reached the midline, she stopped and lost her tracking.

In the perceptual motor skills test, where she had to do the figure eight under her legs while sitting and counting the two ladder, she could not cross over to the other side, and so the form was lost.

With the rainbow throw, she could only throw straight up, not across to the other hand. Throwing under her legs was not even an option, she was confused about which leg to use, where and how hard to throw, and had difficulty keeping her balance. She could not judge the strength with which to throw (perceptual motor skills, direction or timing); this made catching impossible. She showed little spatial orientation, or at least her vertical midline barrier, horizontal midline barrier, perceptual motor skills and hand eye co-ordination (or rather, apparent lack thereof) didn't allow her to achieve the objectives, forms or movements.

Her writing jumped between capitals and lower case, her spacing was cramped or sparse, and her continuous flow forms were a mess.
After three weeks of juggling, she proudly showed me how she could do over a hundred throws with three balls, perfectly rhythmical, accurate throws, integrating left and right, and up and down. Her eye movement tests were smooth and reactive, crossing the midline easily on the lazy eight, and the pain for the convergence disappeared. Her writing was evenly spaced, and a uniform case was used. Although she made a slight error in the flow forms, they were neat and even. Gabi was a huge success story.

Ilha

Ilha appeared to be cross-dominant, possibly undecided. In the first assessment, she was left ear, left eye, right hand and right foot dominant. In her second assessment her ear choice was right and her leg was left.

Her eye movements were good, although her convergence was weak. This improved, and her eyes could converge easily.

Her main problem appeared to be her perceptual motor skills. She could not control her throws or catches, and lost her balance when crossing the midline. She could not integrate her left and right to perform the cross-over 1-2. My impression was that she had trouble with her spatial awareness and orientation, which would form the basis of her perceptual motor skills.

Her number nine was reversed in her original writing test, and her spacing and size was inconsistent.

After three weeks of juggling, she had corrected her nines, and her spacing and size was accurate and neat giving me the impression that
she had developed her spatial awareness through learning to juggle, thus improving her perceptual motor skills.

Josh

Josh has a cross-dominance of left ear, left eye, right hand and right leg. He crossed his hand over to use his left eye with the telescope. This would explain a lot of his difficulties writing and reading. In the convergence, his right eye was weak and hurt, suggesting a muscular problem in the right eye – possibly explaining his use of the left eye.

After three weeks, his eye muscles had strengthened and didn’t hurt anymore on the convergence. He still preferred to use his left eye for the telescope.

His horizontal midline barrier seemed to show retention. He struggled to throw under his legs, and I could see the strain in his face and jaw. And he would lose his balance trying to get under his legs.

After three weeks, he could lift his legs and co-ordinate his top and bottom with relative ease, there was still a bit of movement in the jaw when throwing under the leg.

His integration of left and right was very weak to start: he could not perform the cross-over 1-2, when one hand throws while the other catches. Passing a ball under his legs, while sitting, in a figure eight, and counting (hand-eye-speech co-ordination), he got the form completely confused.

After three weeks he performed the cross-over 1-2 and all the other juggling exercises with relative ease.
He managed to juggle three balls, but had trouble with the rhythm. His perceptual motor skills seemed problematic. He could not time the release of the juggling balls to send them on the correct path, the direction was out of control, he snatched for the catch, not waiting for gravity to bring the balls down to his hands (reaching up), showing anxiety. He was on his toes most of the time. After three weeks he could do all the throwing and catching with ease and accuracy, although he did retain a bit of the anxiety in that he rushed and lost the rhythm.

He did not seem to be able to inwardly imagine the movements and forms of the juggling patterns, and then execute them outwardly. This would account for his lack of perceptual motor skills. After the three weeks he was pleased to show me that he could achieve all the movements that I described, including three ball juggling.

He had great trouble co-ordinating his hands, eyes and speech. In the eye movement tests, he could not move his eyes independently from his head, and his right eye was weak and hurt. Co-ordinating his hand and eye movements with speech failed. He could not keep count, never mind with the rhythms of the movement. He dropped the juggling balls a lot.

After three weeks practice, his head movements stopped, and he could move his eyes freely. This freed him up to allow him to co-ordinate hands, eyes and speech. He could focus on each ball and catch them with ease.

In his original writing assessment, he reversed his threes. This had been corrected in the second assessment.

His continuous flow patterns did not loop in the correct direction. This too, was corrected in the second test. This relates to his spatial
orientation: he can now correctly imagine the forms and directions before writing or drawing them.

Sophie

Sophie demonstrated a cross-dominance of right ear, left eye, left hand and right leg in her first assessment test. She used her left hand to take the telescope and passed it to her right hand before struggling to choose which eye to use. My impression is that she had an unconfirmed dominance because in her second assessment test, she had changed her choice of hand to right, in accordance with her ear and leg. However, she still struggled to choose an eye.

In her first assessment test she missed some elements in the visual/auditory and memory sequencing component. I observed in the second test that her sequencing was accurate and without fault.

She displayed problems with her eye movements, jumping away from the object being tracked when moving left-right and up-down and her lazy eight was jumpy. After three weeks of juggling she did all the eye movement tests easily and without any hiccups.

In her juggling exercises she displayed tension in her neck and had trouble releasing the juggling balls because of her tight grip. She lost her balance when throwing under the legs and had trouble tracking the balls visually on their trajectory. After three weeks of practice, in her second assessment, the only noticeable tension was visible in her tight rip on the juggling balls. She managed to balance with ease when throwing under the legs.
In her writing assessment, Sophie mixed upper and lower case letters when writing her name and had corrected this in her second assessment.
8. CONCLUSIONS

From this short study, it is clear to me and hopefully to the reader too, that juggling can indeed serve as a tool for developing valuable foundation skills which, if not addressed could hinder the child’s ability to learn. This is a brief dissertation that cannot delve into the full potential of learning to juggle. Nevertheless, it has given me insight and inspired me to further this study in years to come. My reports have shown, without exception, that juggling does effect the particular foundation-for-learning skills which I researched in a noticeable and positive manner. I hope that this report will inspire teachers, children and parents alike to value movement in education and child development as well as to see the potential that juggling brings to this field.

FINAL REMARKS

We live in challenging times where we seem to be faced by all sorts of paradoxes and seemingly contradictory thoughts and practices. We live in a time where technology and materialism live side by side with philosophy and spiritualism. Machines are taking the place of human hands and games are played in a virtual world where the only social activity is with zombies and aliens and the only movement necessary is that of the thumbs. We live in a time where many teachers preach a dead language to ears that are unable to hear and hearts that are shattered by stale facts that kill the imagination. Like sheep, these poor innocent children are trained to conform, individuality is suffocated and free thinking, initiative and ingenuity are obsolete in a (contradictory) “constructivist” state education with set outcomes.
There is another way, a healing way, one where technology is used and does not use and control us, one where games are played between real living human beings in our natural world, and one where teachers work out of love for the child and humankind. A way where the whole child is engaged in learning. Yes the head, but through the heart and to the heart by means of actual activity and experience.

These are my personal sentiments, however, it is a fact that more and more educationalists, psychologists, neurologists, medical professionals and others are realising that movement has been put on the sidelines in child development and abstract thinking has taken its place. They are realising that these abstractions and removal from sensory experience through movement is in fact damaging to the development of children.

The difficulty here stands; how, in this technological age, can we attend to this problem? Yes, occupational therapy, but why? This implies that we have neglected or over-stimulated something, thus creating the symptom of one of the thousands of modern childhood dysfunctions, disorders, syndromes or disabilities. It is my firm belief that if, in the home and at school, children are given the opportunity to move in creative, rhythmical and enjoyable activities, they will be receiving the impetus and tools to learn without hindrance, to discover their own potential, to live, in the modern world as free individuals.
9. REFERENCES


Barnard, P. 2009 Skill and dominance go hand-in-hand (online) [http://www.remspeced.co.za/Articles/20060108_0001.htm](http://www.remspeced.co.za/Articles/20060108_0001.htm) (21/09/09)


APPENDIX

Examples of 1\textsuperscript{st} and 2\textsuperscript{nd} assessment tests:

INDIVIDUAL ASSESSMENT

NAME: Gabrielle (Grady)

1. Dominance: Ear... Eye... Hand... Leg... Comments: struggled to open one eye alone.

2. Visual/Auditory: sequencing... good... correct hand... looking and doing...

3. Eye movement: Left/right... weak... slow... moves head... Up/down... couldn't follow... Cross and line... Convergence...

4. Gross motor: Figure eight under leg with counting... struggles w/form... but counts... ok... Rainbow throw... reaches up... can't hold... hard/soft...

Under leg throw to same side... uses opp. leg... can't throw...

Under leg throw across... gets confused... doesn't use right leg at all... Tick-Tock...

Cross over 1-2... round-the-world... could not release even when starting w/l hand... Comments: straight up and down seems fine but left right... crossing the mid line she struggles...
INDIVIDUAL ASSESSMENT

   Comments: scrunched

2. Visual/Auditory: sequencing, correct hand, mirrored feet, looking and doing...

3. Eye movement: Left/right, Up/down, Lazy eight, Convergence, a bit weak

4. Gross motor: Figure eight under leg with counting, Rainbow throw, Under leg throw to same side, Under leg throw across, Tick-Tock, Cross over 1-2
   Comments: Does 3