A Critical Reflection of the Impact of Delayed Physical Development on the School Readiness of Children aged 3-7

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Introduction

This critical review discusses the rise in children not reaching physical developmental milestones, possible causes for this, implications for children once of school-age and the ways in which teaching practitioners can bridge the gaps within the school environment. A rise in reported development delay in children both within the Early Years Foundation Stage (EYFS) and in Key Stage 1 has sparked debate into child readiness for school and what can be done to bridge the gap and help these children reach both developmental and academic milestones once in the school environment.

With an increasing pressure on teaching practitioners and schools to show progress and achieve good results in national testing, especially in the core subjects of English, Mathematics and Science there has been a tendency for Physical Education and Physical Literacy to take a back seat. However, with the sharp rise of children showing physical developmental delays there is now some pressure to re-evaluate the time and importance placed on physical activity especially in light of growing research on the benefits to behaviour and academic success when this is invested in.

The National Curriculum states that by the end of Key Stage 1 'Pupils should develop fundamental movement skills, become increasingly competent and confident and access a broad range of opportunities to extend their agility, balance and co-ordination, individually and with others. They should be able to engage in competitive (both against self and against others) and co-operative physical activities, in a range of increasingly challenging situations' (DfE, 2013: 2).

What is Developmental Delay?

As a child grows and develops they should reach different developmental milestones. Each milestone has an expected normal range and if it is not reached, or reached significantly later than it should be, there is a developmental delay. There are five areas in which development is measured, these are: cognitive development; social and emotional development; speech and language development; gross motor skill development; and fine motor skill development (CASRC, 2008). The risk factors for these development areas are usually environmental or genetic and there are many warning signs (CASRC, 2008). If there are delays in any of the areas this can then have an effect on other developmental areas (CASCR, 2008).

Physical Development Issues in Infants and Children

The physical development of children starts when the brain initially starts to develop in utero. The first movements are controlled by these primary primitive reflexes. These reflexes control all movement before and during the first year of life. They are designed to promote survival in the infant. Gradually, after the first year, the primary primitive reflexes should phase out to be taken over by the postural reflexes which control all movement including balance and posture in an infant.

Unfortunately, some children fail to fully develop their postural reflexes by this time and retain some of their primary primitive reflexes which can lead to a range of movement and sensory problems in childhood (BBAC, 2016; Church, 2016; Plaster, 2016; RNRI, 2016: Schoeman, 2012). The reasons for retained primitive reflexes are thought to occur due to different environmental factors including traumatic births, falls/accidents including injuries to the head, and developmental restrictions such as a lack of tummy time (BBAC, 2016; Church, 2016; RNRI, 2016: Schoeman, 2012).

There are 8 initial primary primitive reflexes these are:

1. Moro Reflex,
2. Rooting (or Suck) Reflex,
3. Palmer Reflex,
4. Asymmetrical Tonic Neck Reflex (ATNR),
5. Spinal Galant Reflex,
6. Tonic Labyrinthine Reflex (TLR),
7. Landau Reflex, and
8. Symmetrical Tonic Neck Reflex (STNR)

(BBAC, 2016; Plaster, 2016, RNRI, 2016).

The ***Moro Reflex*** appears at birth and should integrate by 4 months of age changing from a fight/flight reaction to the adult startle reflex, this reflex responds to all sensory stimuli (BBAC, 2016; RNRI, 2016, Plaster, 2016). Retention can cause social and emotional immaturity, hyperactivity, sensory overloading, anxiety which may lead to poor impulse control, motion sickness, poor co-ordination and balance, being easily distracted and an inability to cope with change (BBAC, 2016; RNRI, 2016). This reflex produces a hormonal response within the adrenal glands which if retained can lead to 'asthma, allergies and chronic illness' (RNRI, 2016: 3)

The ***Rooting or Suck Reflex*** appears at birth and should integrate between 3 and 4 months of age (BBAC, 2016; RNRI, 2016, Plaster, 2016). This reflex can be seen in babies, when you stroke their cheek, they turn towards the stimulus and open their mouths. This helps the baby to breastfeed. Retention can cause problems eating solid food, poor speech, thumb sucking and dribbling, difficulty in combining speech with other movements, hormonal

problems, biting others, abnormal facial expressions caused by tension in facial muscles, and difficulty when using tools such as pencils and cutlery (BBAC, 2016; RNRI, 2016).

The ***Palmer Reflex*** appears at birth and should integrate by 5 to 6 months of age. This reflex is when the baby automatically flexes its fingers to grab an object (BBAC, 2016; RNRI, 2016, Plaster, 2016). Retention can cause fine motor skills issues, messy handwriting, and issues with manual dexterity, children may also have problems processing information and ideas onto paper, spelling problems, and poor posture (BBAC, 2016, RNRI, 2016).

The Asymmetrical Tonic Neck Reflex **ATNR** appears at birth and integrates at about 6 months of age. It is initially to assist the baby through the birth canal as well as distance perception and hand-eye co-ordination. This reflex can be seen when a baby is placed on its back, the baby's arm and leg on the side it is looking at should extend while the other side contracts. Retention may cause problems with handwriting, poor visual tracking, poor hand-eye co-ordination and an inability to cross the vertical midline, problems looking at a board while writing, difficulty with catching, balance issues and children tend to be poor at sports (BBAC, 2016; RNRI, 2016).

The **Spinal Gallant Reflex** is present at birth and should integrate by 3-9 months. It is a reflex that helps with the birthing process. If you stroke a baby's side, it will move towards the stimulus. If you stroke simultaneously down both sides the baby will urinate. Retention may lead to inability to sit still, issues controlling the bladder, clumsiness, short attention span, poor concentration, mobility problems and poor posture (BBAC, 2016; RNRI, 2016).

The **Landau reflex** appears at around 3 months and is to assist with the development of the infant's posture. It is usually integrated by 12 months. Retention can cause low muscle tone,

poor motor development, both gross and fine, and short term memory problems (BBAC, 2016, RNRI, 2016).

The Symmetrical Tonic Neck Reflex or **STNR** appears for a short time at birth then reappears at 6 to 9 months and should integrate by 9-11 months. It enables to child to crawl by dividing the midline. Retention can cause developmental delay, poor hand-eye co-ordination, low muscle tone, inability to sit still, poor concentration, and eye fatigue leading to missed information and slow copying from a board (BBAC, 2016; RNRI, 2016).

The TLR is the reflex that lasts the longest, it appears in utero and is not integrated until about 3½ years. This reflex controls the management of nearly all movement control including rolling, crawling, and walking. Retention can cause poor balance and muscle tone - the child appearing 'floppy', motion sickness, spacial orientation issues, a tendency to walk on toes, visual and concentration difficulties, and fatigue when reading (BBAC, 2016 RNRI, 2016).

Postural reflexes are developed in response to gravity on the body and help maintain the body's posture. These reflexes should be subconscious, a way the body can self-right by controlling its posture, balance and co-ordination. The postural reflexes can be divided into two main types: static and phasic. The static reflexes keep the body upright and balanced. The phasic reflexes are 'a co-ordinated complex response such as the scratch reflex' (Lippincott Williams & Wilkins, 2006).

If these postural reflexes are not developed and the primitive reflexes remain active, then there can be serious issues for the child which, if not addressed, can remain into adulthood. As these are controlled by the neurological system they can then have a wider effect on many of our senses including 'visual, auditory, motor, tactile, vestibular and proprioceptor senses' (Church, 2016: 2). Our postural reactions require muscle control 'our muscles need to be able

to sustain a continuous and passive partial contraction or to resist passive stretch during the restive state' (Schoeman, 2012:1). These reactions are developed by using our muscles regularly to build tone. There is a wide range of specific and general exercises which can increase our postural reactions (Schoeman, 2012).

Piaget's learning theory was based on a model of child development, he proposed four stages of development. These are the sensorimotor stage which lasts from birth to 2 years of age, the preoperational stage which lasts from 2 to 7 years of age, the concrete operational stage 7-11 years of age and finally, the formal operational stage 11+ years (Atherton, 2013; McLeod, 2009; Santrock, 2004). In the sensorimotor stage he believed that the primitive reflexes were innate schemata which are then built on using assimilation (incorporating new knowledge into an existing schema) and accommodation (adjusting the schema due to new information) (Allyn and Bacon, 2004; Cox and Coulson, 1979; McLeod, 2009; Santrock, 2004). Using the senses combined with motor skills the infant builds cognitive abilities and is then able to move on to the preoperational stage. If this sensorimotor stage is interrupted or delayed this will then have an effect on moving into the preoperational stage and therefore delay development both physically and cognitively.

Possible Causes of Development Delay

In recent years there has been a rise in the number of children with sensory and motor issues and some believe that this is in part caused by the rise of 'container babies'. Container baby syndrome is when the child spends large amounts of time in car seats/child carriers, push chairs, bouncy chairs, among other equipment (APTA, 2016, Follart, 2015; Rockwood, 2016). There is a vast amount of equipment on sale to help keep babies safe and relaxed, transport

them and allow controlled play time which can have a detrimental effect on the developing child by keeping them contained within a space. While the baby appears safe, prolonged use can lead to lifelong problems including physical deformities such as, head and face deformities, including “flat head syndrome”; decreased muscle strength and co-ordination; speech, sight, hearing, and thinking problems; Attention Deficit Hyperactivity Disorder (ADHD); and obesity (APTA, 2016, Follart, 2015).

There is a growing body of thought that many children are not developing the core strength to function effectively on a daily basis and this therefore impacts on their school readiness, this could be linked to container baby syndrome and the lack of opportunity to develop their reflexes effectively. Hansome (2015) conducted research which suggests that compared to the early 1980s only 1 in 12 children now have normal strength and balance. This has been reinforced by research in both the USA and the UK by a number of professional bodies including physiotherapists, educationalists and doctors.

Core strength is based on the inner and outer core muscles. These inner and outer systems work independently. Inner core muscles comprise of the posterior fibres of the internal oblique, the pelvic floor, the respiratory diaphragm, the multifidus, and the transverse abdominis (Roberts, 2013; Richardson et al., 1999; Chek, 2004 cited in Maclean, 2006). They provide stability to the trunk/spine. The outer core system is comprised of four subsystems, the deep longitudinal, the posterior oblique, the lateral system, and the anterior oblique (Vleeming, et al., 1990a and 1990b cited in Maclean, 2006). These systems not only work with the inner core muscles to aid stability but also have the role of movement initiation (Richards et al. 1999 cited in Maclean, 2006).

Poor core strength can lead to a variety of perceived bad behaviours in school aged children, these include fidgeting, poor concentration, decreased awareness of their bodies, illegible handwriting, clumsiness, poor fine motor skills, and lack of motivation to participate in physical activity (Examiner, 2011; Mathews, 2016; Schoeman, 2012). Other symptoms include poor posture, inability to memorise and retain information and not being able to perform simple movements such as bending to touch their toes (ILS, 2016).

Many of the symptoms described in retained primary primitive reflexes, container baby syndrome and poor core stability are also those found in a number of special educational needs (SEN) children. Over the last fifty years we have seen a dramatic rise in the number of disorders such as dyslexia, attention deficit disorder (ADD), attention deficit hyperactivity disorder (ADHD) and autistic spectrum disorder (ASD). Some of this is due to better understanding and diagnosis of disorders and some is due to changes in diagnostic criteria, there is a possibility that weak core strength and physical development delay could exacerbate these conditions and therefore addressing this through interventions could have a positive effect on people with these conditions.

Implications for the School Environment

Educational practitioners need to be very careful within the school environment that they are aware of the causes of what is observable and perceived 'bad behaviour'. If a child does not have the core strength to sit still and concentrate, the practitioner must be mindful they are not using conditioning techniques which reinforce the behaviour or penalise the child for actions that are beyond their control. Classical conditioning within the classroom must be based on providing as many positive learning experiences for all the children so that they do not start to associate school with fear. Positive reinforcement could include repeating clear

and concise instructions, possibly combined with visual or auditory stimuli, such as a song, clapping or flashing lights, that over time conditions learners to behave in a certain way. This could, for example, be a 'tidy up' song. Practitioners should be vigilant they do not penalise students using this method as, if the child learns to associate conditioning stimuli with fear it could provoke a negative response, as the practitioner's response to a child who always gets the answer incorrect when they put up their hand in class. By using positive reinforcement for effort as well as outcome you can build self-esteem and positive experiences without having to rely on physical rewards such as a token economy, for example using stickers to earn prizes (McLeod, 2015).

By using Vygotsky's theories on scaffolding we can help build children's confidence. With children who have poor concentration and memory this is especially important and combined with metacognitive strategies developed from Siegler's information-processing approach could aid children to build strategies they can use in order to encode new information in a way in which it can be then stored and retrieved when needed (Santrock, 2004).

"In proposing the recognition of reciprocal scaffolding and self-scaffolding as legitimate and important classroom activities, we are advocating the progressive devolution of the role of scaffolding agent from teacher to learner as a significant curricular goal" (Houlton and Clarke, 2006: 141).

In recent years there had been a move towards a combination of Piaget and Vygotsky's theories called the Dynamic Systems Theory (Fischer and Bidell 1998, 2006; Van Geert 1998, 2006). Applying this, combined with the pyramid method (van Kuyk, 2011), - may be more

beneficial to children with development delay, as they are not based on timed stages but work on a spiral system from birth until 20 years of age (van Kuyk, 2011). This involves incorporating a scaffolded form of play that builds from the child's normal development to the child's optimal development by promoting self-regulation. Van Kurk (2011) describes this method as a creation of 'physical and psychological space for self-regulation through play and initiative learning and the teacher can scaffold the improvement of play and initiative learning' (p134). This is a similar system to Bruner's spiral curriculum which revisits information repeatedly and builds on and adapts former knowledge, scaffolded by the teacher (Howard, 2012).

All small children need to be taught how to look beyond the obvious in order to select relevant information. Children who are spending a great deal of their cognitive processes focused on controlling their bodies may need adjustments made to their environment and the teaching styles and techniques used by the practitioner, these could include smaller group sizes for teaching input, or carpet times, altering the classroom environment to reduce visual and auditory distractions/disturbances, designing lessons that involve movement to learn, as well as introducing exercises to help strengthen the core, inhibit primitive reflexes and develop postural reflexes.

Many schools and teaching practitioners use a variety of applied behaviour analysis techniques. These can often have both positive and detrimental effects on students with development delay, as stated before the behaviours of these children are often involuntary. By using effective reinforcers, differential reinforcement, prompts and shaping techniques that are targeted to individuals, similarly to the use of positive operant conditioning, can be

really beneficial to these pupils. Whereas, a behaviour contract, and techniques which are designed to decrease undesirable behaviour, such as terminate reinforcement, the removal of desirable stimuli and present aversion stimuli, can have negative impact and often will not work (Santrock, 2004). This is because the child simply cannot live up to the agreement and after a period gives up 'trying to be good' because as it is simply unattainable.

Effective Interventions and Initiatives

Recently there has been an initiative which started at St Ninian's Primary School in Stirling, Scotland called 'The Daily Mile'. This was developed in response to teachers' complaints about the children being unfit, which was backed by observations of P.E lessons. The Head trialled running different classes around the school field. Over the course of an academic year this became 5 laps (1 mile) for all school children including those in the nursery. Every pupil has to participate for 15 minutes a day at a time decided by the class teacher. They have seen dramatic increases in fitness, have seen behavioural improvements and academic improvements which are now being studied. They can now boast that they have no overweight or obese students on roll and are lucky to be supported by the whole community (Scottish Government, 2016). The success of this initiative has seen other schools adopt this approach with some predicting it may become standard practice in all UK primary schools in the future.

In South Leicestershire, there has been a developmental movement programme developed as a direct response to the number of children having physical developmental delays called 'Big Moves'. It is based on improving physical literacy skills in order to promote better functional skills. Over a 5-year period they recorded the results the programme had on

children who took part for twelve weeks (Appendix 1), the results highlight the need for nationwide investment in physical literacy programmes (Learning South Leicestershire School Sports Partnership, 2016).

Other types of intervention could also be similar to the Kinetic Letters initiative where children are taught handwriting through a well-structured formal programme that initially builds on core strength and gross motor skills, then introduces fine motor skills and problem solving techniques such as postural and pencil grip corrections, to develop and understand the basic principles needed for graphology.

In Conclusion

In conclusion, whatever the reasons for the reported sharp rise in physical development delay in children there is overwhelming evidence for a more rigorous system of checking and treating developmental delay, by both health professionals and within the education sector. Investing in children to ensure they are 'school ready' so that the pressures we place them under are appropriate, is essential. Having educational practitioners who value, promote and have good subject knowledge of both physical education and physical literacy, and the effects these can have on children who are deficient, is critical in enabling children to reach their optimal potential.

Schools need to appreciate the benefits of physical literacy programmes, not just as a tool for healthy individuals, - but for all pupils' attainment in all subject areas. While some initiatives, such as, The Daily Mile may not be appropriate for all schools due to their demographic

location and access to safe areas, schools should consider adopting whole-school programmes that suit them and show values in practice.

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Appendix 1

In South Leicestershire, Big Moves™ (Schoeman, 2012) has been delivered in more than 60 schools over the past 5 years, focusing on working with children in each school with the poorest physical literacy skills over a 12 week period. The impact of the work has been monitored across a range of measures, and the results have shown a significant impact:

Impact measure	**% showing an improvement**
Improvement in physical movement skills	94%
Improvement in handwriting / fine motor skills	71%
Improvement in concentration & listening	75%
Improvement in ability to sit still	75%
Improvement in showing initiative	63%
Improvement in self care (i.e getting dressed)	67%
Improvement in social involvement	66%
Improvement in behaviour	62%
Improved academic progress	64%

Learning South Leicestershire School Sports Partnership (2016) Big Moves at:

http://www.learningsouthleicestershiressp.org.uk/increasing-participation/big-moves

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