

PSYCHO-EVOLUTIONARY STRATEGIES TO TEACH READING

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Introduction

Reading is for many people a pleasurable activity. But for many others it can be a chore to avoid. Knowing how to read is a skill essential for survival and progress in today's world. Reading demands the co-ordination of highly sophisticated specialized physical and mental processes. How do we command such a complex and demanding task? Or do we? This paper discusses the use of multisensorial communication strategies as psycho-evolutionary approaches to learning reading.

So what is evolutionary psychology?

Evolutionary psychology is an holistic approach that combines the psychological sciences with models from evolutionary biology, cognitive science, anthropology and neuroscience. It provides a framework to unify our understanding of human behaviour and culture, based on the assumption that the human mind is a set of cognitive mechanisms that are adaptations to the environment experienced in the Pleistocene. It is then central to this approach that the mental apparatus has evolved by natural selection in the same way as other human anatomic and functional systems (1, 2, 3).

Reading and evolutionary psychology

Have humans evolved to read?

Most of human's existence has been spent in small nomadic groups, where information could be exchanged directly between the sender and the receiver. Stimuli in our ancestors environment were very different from the stimuli of today's technical, fast moving environment. Reading and writing are recent human inventions, and are non-instinctive activities that are not shared by all cultures (2). For how long has reading been imposed on vast numbers of people? When was compulsory schooling first imposed? Selection operates over thousands of generations and, compared with our ancestors' brains, our brains have not had the time to evolve to be adapted to reading which is a very recent invention. The time of evolution of a written system can be discarded when compared with the total human evolutionary process, and so far there certainly has not been enough environmental pressure for humans to need to adapt.

Reading as an activity that demands unnatural physical and mental strains

Learning how to read involves learning how letter sequences correspond to phoneme sequences. At the same time the child abstracts the relationships between single letters or letter groups and phonemes. Gradual learning of associations between written letter sequences and spoken phoneme sequences and meaning occur in the process. The interconnections between sets of orthographic, phonological and semantic representations become interrelated and more sophisticated (4). The whole process requires fine, rapid changes in the perception of sound, image, meaning and movement. Such fine perceptual, muscular and mental requirements were not present in the Pleistocene environment. The typical posture for reading is sitting down, with the head tilted forwards, with the eyes close to the text very often in poorly ventilated rooms. Again these environmental conditions were not present in the Pleistocene. Let's analyse what such environmental conditions might affect.

Sitting down

Back pain has reached epidemic proportions in the West, and sitting down is one of the factors. Many children sit most of the day at school, and most of the day at home. We have not been designed to sit down for long periods of time and the spine is most efficient when we are in the upright position and walking, running or standing around were the main postures of our nomad hunter-gatherer ancestors. Ironically, the more we sit down the less our body copes with standing up. Sitting down reduces the spine into a compressed C shape affecting the inter-vertebral joints, ligaments and squashing the discs. The buttock, abdominal and back muscles become redundant and lose their tonus, and eventually become unable to sustain the spine in the upright position. In their place, fat deposits start appearing, aided by a lower activity rate and lower metabolic rate. The digestive system is affected, as is the vascular system. The time and repetition factors, and the cumulative stresses imposed on the spine can lead to structural failure (5).

The eye

Nothing in nature is as demanding for the eyes as reading and therefore our ancestors would not have experienced such challenges. Reading requires a fine-tuning of the eyes. To read, the eyes have to be able to stop and see letter by letter and they have to see the word as a whole. They also have to move fast and initiate the same process for the next string of letters that constitute the next word requiring the co-ordinated action of several types of muscular and nerve fibres. Another important factor is that black on white is not the combination that gives the best contrast for detailed recognition of characters. Our ancestors would certainly not have had visual challenges that require such co-ordination of focussing and shifting, with the intensity and regularity that reading requires. This effort can constitute an aggression on the eye with implications to other systems. For example, myopia usually starts in childhood and gets progressively worse through adolescence. Some children are susceptible to myopia but the triggers are thought to be environmental. The biggest contender is near work such as reading, sitting at the computer, or too close to a TV screen. The epidemic proportions of myopia are related to the time children spend sitting down reading and myopia progresses faster during term time than during vacations. In non-westernised societies myopia is almost non-existent (6). Binocular function may also become altered (7).

The ear

Decoding a new word requires translation between letters and sounds and children need to know of letter sounds to create mappings between the orthographic and the phonological forms of words. It is then reasonable to expect that children with good phonological skills have greater capacity to learn the names and sounds of letters, and therefore greater ease in

learning how to read (4). But reading tasks are carried out having the head, and therefore the ear, tilted down which is not bio-mechanically desirable. The inner ear houses delicate and precise anatomical structures that are involved in the process of sound transmission and de-convolution. It also houses a complex and intricate apparatus, essential for the detection of motion and gravity, fundamental for balance. By having the head tilted for such long periods of time compensatory mechanisms for balance have to be activated (8). Pollution also affects the fine balance in the inner structures and ear infections are on the increase. Again this would not have happened to our ancestors.

Proprioception

Since not all bodies have the same ability to deal with repeated and prolonged aggression other dysfunctions can occur that involve proprioception and bio-mechanical stability. Eye movement; balance; muscle tonus; co-ordination of skilled voluntary movements; prediction of immediate body position during complex movement and adjustments that ensure smooth, precise, directed movement; planning and initiating voluntary activity; and procedural memories are all linked to the cerebellum (9). Symptoms concerning alterations in several or all of these functions have been identified in people suffering from Postural Deficiency Syndrome, where proprioception is disabled and a deviation from the ideal bio-mechanical equilibrium is reached (7,10). Most of the times this leads to an unconscious distorted concept of body posture and the self in space, a lack of appreciation of the body scheme, and lateral ambiguity. Visual alterations, lack of memory, difficulty in paying attention, emotional instability, banging against objects, falling down, feeling tired on waking up are some of the complaints. Since no brain areas are shown damaged in brain scans, many patients are thought to suffer from a range of psychopathologies (8).

Room ventilation

In poorly ventilated, warm rooms the levels of oxygen are low and constantly decreasing and the levels of CO₂ increasing. Without optimal gas exchanges, the body enters a state of energy saving and effort minimisation, in detriment to attention and learning. In such environments the process is further accelerated if the heating is on. Sitting down in such conditions is similar to being in a sensorial deprived environment, and children have to fight against sleepiness.

Emotions and stress

Emotions influence fundamental processes involved in learning: perception; attention; inference; information gathering; learning; memory; motivational priorities; communication processes; energy level and effort allocation; affective coloration of events and stimuli; and conceptual frames (1). All the physical stress that is unknowingly being inflicted on humans as they adopt non bio-mechanical postures can lead to and exacerbate emotional stress and related psychopathologies which can go from occasional states of instability to disrupted sleeping patterns, disruptive behaviour, aggressiveness, denial and others. Stress can enhance fear of school that can last for the remainder of people's lives, and many adults experience vivid nightmares of their school days.

Delays in reading due to deviation from bio-mechanical balance

Delays in reading have been classified in three main groups. Brain damage that compromises the brain structures involved in reading, including aphasias. Primary delay where the brain structures involved in reading are intact but the ability to deal with the symbolic value of letters and words is compromised, compromising the de-coding of written material. Finally,

secondary delay when the reading difficulties are due to psychopathologies (10). Spatially disparate cues tend to induce a profound decrease in responses to external stimuli (11), and it is acceptable to expect that children with a poor concept of body posture and balance difficulties may feel switched off from the surrounding stimuli. This would contribute to difficulties in decoding written material and therefore reading. Lateral ambiguity is associated with proprioception and the postural deficiency syndrome, and has been linked to learning difficulties and slower speed of learning factual information. Many dyslexic children and adults present difficulties in distinguishing left from right as well as having a distorted body scheme representation (10).

All the factors analysed above are expected to affect reading by primary and/or secondary delay. Humans are not evolving towards better readers, but social selection is favouring those children who can sit for longer without acquiring distortions of their body, and who can therefore maintain their posture, and bio-mechanical stability unaffected by environmental impositions. Those who have innate or acquired defences against environmental aggression are the ones most likely to succeed in the school environment as it is now, irrespectively of their initial potential abilities

Multisensorial communication strategies as psycho-evolutionary strategies to teach reading

From all that was presented in the previous sections it can be concluded that schooling systems that rely heavily on having children sat down are conditioning children to adapt to a potentially damaging environment with immediate consequences for their learning and long term consequences for their health.

Multisensorial communication strategies (12) are psycho-evolutionary approaches to learning since they simulate exploratory environmental conditions parallel to those faced by our ancestors. To adopt these strategies requires a conceptual and practical leap from the traditional schooling system. The same spaces and materials that are used traditionally can still be used, as long as the spaces are rearranged and the materials used creatively.

Multisensorial

Best learning occurs when several senses are involved in the learning process. A prominent feature of the human brain is the ability to detect, integrate and classify relationships between different sensory events. For example, auditory speech perception is improved when the person attending to the message can see the speaker's face (13). In noisy environments, watching a speaker's lips during face-to-face conversation markedly improves speech perception, and linguistic visual cues are sufficient to stimulate the auditory cortex even in the absence of linguistic sound cues (14). Research on the integration of information shows that when different senses are involved, detection and identification of external stimuli is enhanced. Discrimination of stimuli and reaction times to those stimuli are improved compared to information from only one sense (11). The interaction between audition and touch is very powerful in determining the perception of stimuli and what people feel can be affected by what they hear (15).

Multisensorial communication strategies aim at stimulating as many senses as possible to facilitate learning. Many activities already used in schools are multisensorial and are referred below but are consistently dismissed as play rather than powerful learning tools by many practitioners. Multisensorial communication strategies integrate research into the senses, and learning activities are designed strategically having in mind the achievement of the specific

learning outcomes by redesigning tasks that allow children to walk around and discover using as many senses as possible. Creative tasks enhance the curiosity, awareness, motivation, challenge and emotion of our ancestors' environment.

Communication

Reading is a skill that is not instinctual and therefore cannot be learnt without the guidance of someone who knows how to read (16). It therefore requires social interaction and it is easy to fall into power relationships instead of fostering positive attitudes, and inducing and supporting strategies that children cannot initially use on their own. To communicate effectively entails rethinking learning and rethinking teaching. Teachers should see themselves as learning enablers, and be coached to facilitate the construction of knowledge rather than the accumulation of facts. Communication should be about exchanging, sparking curiosity, motivation and rewarding emotions. To enable learning, skills have to be acquired, developed and permanently built upon.

Strategies

Programming and planning as well as the ability to be flexible and resourceful are fundamental to achieve a conceptual leap as well as a practical leap into psycho-evolutionary strategies. Interactive, multisensorial activities require integrated and co-ordinated approaches, and the skill to enable an open environment whilst maintaining a structured foundation. Learning can and should be fun, but it must not be forgotten that without dedicated work and perseverance children will not acquire the required level of achievement. To plan strategically it is important to reflect on the children's potential and differences. It is also important for the teachers to know about their own learning styles, abilities and difficulties. Learning to read can be enabled using groups as learning units, and taking advantage of the ability spectrum and complementary preferences within the classroom.

Revisiting old techniques through a new perspective

Songs and rhymes with co-ordinated gestures

The children's learning environment at home, nursery and at school is relevant for the development of reading and spelling. Knowledge of names and sounds of letters provides an important foundation for segmentation skills and for reading and spelling development. Songs and rhymes provide rhythmical stimuli and enable the awareness of phonetic cues. Sound, words and coordinated movements are classic enjoyable learning tools.

Specialised TV programmes, videos and computers

Programmes like the American production *Sesame Street* and the Swedish *Five ants are more than four elephants* have been very successful and highly recommended for their educational value. They provide interactive activities, and combine visual, auditory stimuli, with songs and rhymes. Several specialised videos of good quality are now easily available. Computer packages with high ludic content and interaction features are very much enjoyed by children. The use of TV, video and computers should be limited because of the postures adopted by children as they sit down to watch/play.

Tactile 2D and 3D letters

These allow children to split, re-assemble and make words and word-families, allowing the child to an increased awareness of word composition and decoding unfamiliar words. Included are the use of wooden letters with the soft warm texture of wood; rubber letter stamps that have the added advantage of the use of colour, paint, paper and the possibilities of

changing the surroundings; magnetic letters that are a favourite in parents kitchens and that children truly enjoy manipulating; plasticine, play dough and clay letters produced by children.

Games and toys

Games and toys are universally enjoyed. Curiosity, imagination, creativity, movement, building, pretending can be revisited time and again using the same objects in different ways.

Letters or words in context associated with tactile quality

In *Letterland* stories and materials, each letter shape forms part of a person, animal or object as well as being the initial letter for their name. Double-sided magnetic squares with a letter on one side and a pictogram on the other combine the tactile properties of an object, with the allure for magnetic properties and the context given by the pictogram.

Labelling objects around the schoolroom or other environment using sticky labels helps children to recognise simple words. The labels can later be jumbled and a game can develop where the child places back the labels where they belong. A further approach is to then place labels with the starting letter on the objects and play guessing games such as 'I spy with my little eye something beginning with...'.

Flash cards & images

Children tend to read words that represent something concrete better than words that are equally easy from a decoding point of view but that do not have a well-specified semantic representation, and without the imagery hook they may be more difficult to learn. Combining flash cards and images, and adding a strong phonologic support can enable children to recognise whole words.

Children's literature

Books that allow children to play and manipulate tactile features and provide surprises stimulate childrens' curiosity. They tend to look forward to reaching the next surprise on the next page.

Theatre and puppet shows

Children interact with actors and puppets and easily enter exchange dialogs that can be used to promote letter recognition and word identification in or out of context. Children can get up and intervene in the play.

Tactile, tasty food products

Pasta and other food products in letter shapes are powerful in involving the eyes, the hands, the taste and smell and can turn meal times at nursery, at school and at home into highly attractive opportunities for children to learn how to read.

Useful messages and instructions: phone messages & shopping lists

Learning in a real situation is very empowering for children. Children greatly enjoy pushing the trolley at the supermarket and getting the products needed. Reading the labels on the packaging can become a fun way of motivating children to be aware of the need to read. Allowing children to help whilst cooking, and showing them the written list of ingredients in recipes combines flavours and tastes with a real educational context.

Pre-empting pleasurable multisensorial events as a stimulus to recognise words

Before a pleasurable activity such as playing with sand, drawing and painting, or meal time children are more likely to make an effort to recognise words such as their name. Small children aged two can recognise their own name out of a series of names that are shown for example as posters.

Involving parents participation

Parents are advised to take an interest in what the child is doing at the nursery or school, and to motivate their child to communicate the activities they enjoyed/disliked during the day. Positive, specific feedback is also encouraged for when the child does well. Enabling the child to ask questions, listening to others and trying out new skills are also seen as major contributions for the child's learning that parents can support. Daily support and dedication for short periods of 10min makes all the difference.

Conclusions

Reading demands the perception of graphic signs that have associated symbolic values. It involves maturity in diverse domains such as physical, emotional, neurological (including proprioception and psycho motor) and social. This paper elaborates on the use of multisensorial communication strategies as psycho-evolutionary approaches to learning reading. A definition of evolutionary psychology is given, and implications for acquisition of reading as a complex skill in today's environment are expounded. It is argued that from a psycho-evolutionary perspective as compared with our ancestors we have not had enough time and pressure to evolve into more proficient readers. It is also discussed that the reading process involves unnatural, unwanted postures that constitute repeated and prolonged aggression to the human bio-mechanical stability. This aggression has been associated with diverse disorders of epidemic proportions that affect children's proprioception, psycho motor development, and behaviour, and is associated with psychopathologic conditions. The children with best defences against aggression are the ones most likely to succeed irrespective of their initial potential abilities. Multisensorial communication strategies stimulate children's senses and enable children to embrace educational contexts and activities that require them to move around, to discover and be creative. To simulate our ancestors' environment we need to promote curiosity, motivation, challenge and emotion. By programming and planning, and by judiciously using space and materials the highly artificial conditions of the classroom can be turned into productive, friendlier, safer and enabling educational contexts.

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