



The Montessori Method and the Neurosequential Model in Education (NME): A comparative study

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Abstract: The Neurosequential Model in Education (NME) is described as a developmentally sensitive and biologically respectful approach to development and learning. This paper postulates that the NME shares many commonalities with the Montessori Method in that it, too, is developmentally sensitive and adheres to biologically respectful concepts. This paper compares some of the core principles and recommended practices of the NME with those in the Montessori Method and argues that they are consistent in many ways. The paper also examines Dr. Montessori's unique use of "sensitive periods" in development for educational purposes, in particular her use of the sensitive periods for movement, the social aspects of life, and the sensitive period for order respectively. It argues that in doing this, she was actively promoting an approach to human development and education that appears to correlate with what Dr. Bruce Perry calls a developmentally sensitive and biologically respectful approach to learning. The goal of this study is to show the science behind why many of Dr. Montessori's original practices worked and had such a positive effect on children. This knowledge should empower Montessori educators and give them the confidence to promote authentic Montessori practices in the knowledge that they are in line with current neuroscientific theories that have been shown to be beneficial to children.

Is Montessori a genius? Is her book a real contribution to educational thought? Has her method something in it vital and universal? (Stevens, 1912, p. 78)

Maria Montessori (1870–1952) could well be described as a brain scientist ahead of her time. She became a medical doctor in 1896 and specialized in psychiatric conditions in children (Babini, 2000). She

then turned her attention to education and human development (Babini & Lama, 2000; De Stefano, 2022; Kramer, 1976; Standing, 1957). In the above quotation, the book Stevens refers to is Dr. Montessori's seminal publication, which has been known as "The Montessori Method" since it was first translated into English in 1912. However, when Dr. Montessori first published this book in Italian in 1909, she gave it the title, "*Il Metodo della*

Pedagogia Scientifica applicato all'educazione infantile nelle Case dei Bambini," which means in English, "The Method of Scientific Pedagogy Applied to the Education of Young Children in the Children's Houses." Historically, "Scientific Pedagogy" was what the Montessori Method was all about.

The Neurosequential Model in Education (NME) was developed by and is based on the work of the neuroscientist and child psychiatrist Dr. Bruce Perry. The NME is a non-therapeutic adaptation of the Neurosequential Model of Therapeutics (NMT), also developed by Perry. The NMT, which started out as a purely clinical approach related to Perry's work, is an approach that incorporates key principles of neurodevelopment into the clinical problem-solving process. Perry describes it as "developmentally sensitive, neurobiology-guided practice" (Perry, 2009, p. 248). The NME, on the other hand, is non-therapeutic. Perry describes it as "a developmentally sensitive and biologically respectful approach to learning" (ThinkTVPBS, 2020a). The NME has universal application across the entire spectrum of children but is especially beneficial to children with developmental problems. The NME is a "train the trainer" model in which teachers (often school principals) are trained in the NME and then pass that training on to other teachers in their school or district. The goal of the training is not to turn teachers into therapists, neuroscientists, or psychologists; rather, the training guides teachers in identifying the child's primary developmental problems and then aids them in developing a rehabilitative plan that helps to reduce difficult behaviors and increase the child's ability to engage successfully in developmentally appropriate educational activities.

This paper compares some of the core principles and recommended practices of the NME with those in the Montessori Method and outlines the shared features of the two models and shows how Dr. Montessori's early work anticipated many current principles in neuroscience. It also examines Dr. Montessori's unique use of "sensitive periods" in development for educational purposes (in particular, her use of the sensitive periods for movement, the social aspects of life, and order, respectively, and argues that, in utilizing the sensitive periods for educational purposes, she was actively promoting an approach to human development and education that appears to correlate with what Perry calls a "developmentally sensitive and biologically respectful approach to learning" (ThinkTVPBS, 2020a).

Method

This paper compares some of the neuroscientific principles of the NME with practices in the Montessori Method to shed more light on the science behind Dr. Montessori's success with children. To do this, the author conducted an analysis of available sources on the NME. These sources comprised of books, articles, interviews, seminars, YouTube webinars, and online courses relating to the NME. In addition, the author conducted an analysis of four of Dr. Montessori's seminal books—*The Montessori Method* (1912/1964), *The Secret of Childhood* (1936), *The Absorbent Mind* (1949/1967), and *The Formation of Man*, (1949/1975)—and her pamphlet, *The Four Planes of Education* (1971, from a lecture delivered in 1938). These five publications were selected because they are generally recognized as reliable sources of Dr. Montessori's core concepts. Additionally, an analysis of Jean Marc Gaspard Itard's (1802) book, *An Historical Account of the Discovery and Education of a Savage Man*, and Édouard Séguin's (1866) book, *Idiocy and Its Treatment by the Physiological Method*, was also conducted because Dr. Montessori repeatedly stated that her work builds on the work of Itard and Séguin. These combined sources yielded a large amount of data. Braun and Clarke's analytical model on thematic analysis was used (Braun & Clarke, 2006, 2022). Specifically, the literature was examined, coded, and categorized into themes. Subsequently, the theoretical concepts (as outlined in the theoretical framework below) shaped the final identified themes.

Theoretical Framework

This study is centered on the concept of offering children a developmentally sensitive and biologically respectful education as expounded by Bruce Perry in his Neurosequential Model of Education. It is also centered on Dr. Montessori's own original concept of providing children with a developmentally sensitive and biologically respectful education, which includes her utilization of "sensitive periods" in human development from the standpoint of education, as expounded in her seminal publications listed above.

Results

The analysis identified three major themes: (a) The 6 R's of the NME, (b) How the 6 R's of the NME

align with the Montessori Method, and (c) How Dr. Montessori utilized sensitive periods in development to provide children with an educational approach that anticipates what Perry calls a “developmentally sensitive and biologically respectful approach to learning” (ThinkTVPBS, 2020a). We now review each theme.

The 6 R’s of the Neurosequential Model in Education

The first theme identified from the analysis relates to the “6 R’s” of the NME. In an NME classroom, there is an adherence to 6 R’s. This means that the classes try to be the following:

- 1) Relational (promoting a sense of kinship and safety). NME educators are trained to build quality human relationships with their students, especially with the students who present the most challenges, because “Positive relational interactions” have been shown to promote “healthy development” in children (Ludy-Dobson & Perry, 2010, p. 27). For children who have been emotionally damaged, Perry and Szalavitz (2017) argue that “The more healthy relationships a child has, the more likely he will be to recover from trauma and thrive. Relationships are the agents of change, and the most powerful therapy is human love” (p. 258). Perry emphasizes “the primacy of human connectedness,” the power of “connectedness and belonging” (Perry & Winfrey, 2021, pp. 270, 249), and the importance of community (ThinkTVPBS, 2020c).
- 2) Rhythmic (resonant with neural patterns). NME educators are trained to utilize rhythm in their classes (e.g., walking, music and movement sessions, dancing, balancing exercises, yoga, drumming sessions, and group singing), because such activities “would be organizing and regulating input that would likely diminish anxiety, impulsivity” (Perry, 2009, p. 243).
- 3) Repetitive (having repeating patterns). NME educators are taught that the brain only changes through “patterned, repetitive activation” (Perry, 2009, p. 244). Educational content, therefore, should be offered as creatively as possible keeping this core concept of repetition in mind.
- 4) Relevant (developmentally matched to the child). NME educators are trained to be aware of the varying developmental levels of their students so they can offer content that is appropriate to the students’ level of comprehension (ThinkTVPBS, 2020e).
- 5) Rewarding (giving pleasure). NME educators are trained to keep at the forefront of their minds their

student’s need for success, knowing that the pleasure of learning something new will naturally lead to the desire to learn more (ThinkTVPBS, 2020e).

6) Respectful (of the children, their culture, and their immediate and extended families). NME educators are trained to respect the diverse cultural backgrounds of students and their families and to use these backgrounds as a springboard to learning (ThinkTVPBS, 2020a).

How the 6 R’s of the NME compare with the Montessori Method

The second theme identified from the analysis of the literature relates to how the 6 R’s of the NME align with the Montessori Method. As stated above, in an NME classroom, the 6 R’s mean that the classes need to be relational, rhythmic, repetitive, relevant, rewarding, and respectful. In this regard, there is much commonality between the NME and the Montessori Method.

Firstly, an analysis of the literature selected and scrutinized for the purposes of this study shows that there is a strong commonality between the “relational” aspect of an NME classroom and the “relational” approach advocated by Dr. Montessori in her method. As early as 1897, when Dr. Montessori began to work with mentally challenged children, she realized the importance of positive, relational interactions between teachers and children. When describing her work with these children, she wrote,

When these children from the streets and from the asylum entered my school they were greeted with hearty manifestations of welcome and with genuine cordiality. For the first time they were made to feel that they were wanted and desired. (Montessori, 2008, p. 264)

She went on to describe how these children flourished emotionally, socially, and cognitively, even managing to pass the Italian State exams, much to the amazement of the public. Moreover, as early as 1904 in her lectures at the University of Rome (which later became the main content of Dr. Montessori’s 1913 publication *Pedagogical Anthropology*), Dr. Montessori stated, “What really makes a teacher is love for the human child” (Montessori, 1913, p. 34). She also recognized the power of love as a force for human flourishing. She wrote: “This force that we call love is the greatest energy of the universe” (Montessori, 1967, p. 290). She asks: “Why should it not always be a subject for study and analysis, so that its power can

become beneficent?” (Montessori, 1967, p. 290). She writes: “Every contribution able to bring out the latent power of love, and to throw light upon love itself, should be welcomed with avidity and considered of paramount importance” (Montessori, 1967, p. 290).

Dr. Montessori also recognized the fundamental importance of community and having a sense of belonging. In a rare Montessori article based on a lecture she delivered in Kodaikanal, India, in 1944, she stated, “In English, there is the famous sentimental expression ‘Home! Sweet home!’ For the adult, the idea of home rings with similar satisfactory notes. But where is the child to find an answer to his need? In the ‘House of Children,’ we endeavor to give to the child the relief of feeling, for once, ‘at home’” (Montessori, 2013, p. 11). In another publication, she repeatedly stated that her schools were not *houses* of children but rather *homes* for children with all the warmth, love, and sense of belonging that a good home signifies (Montessori, 1967). She made her schools into little communities where children felt they were useful, welcomed, and loved members of a social group (Montessori, 2008, p. 264), and they showed evidence in their social, emotional, and behavioral growth that they were flourishing as human beings (Montessori, 1964, 1936). These statements by Dr. Montessori (and there are many more) resonate strongly with what Perry has discovered about the healing power of love and the need for schools to be relational. Also, Perry, in agreement with Dr. Montessori, states that “the most powerful therapy is human love” (Perry & Szalavitz, 2017, p. 258).

Secondly, Montessori and Perry express similar views about the need for schools to make use of rhythmic exercises and activities. As far back as 1897, when she first worked with mentally challenged children, Dr. Montessori recognized the importance of rhythmic activities to calm the brain. Following and surpassing her predecessor Séguin, she made use of what Perry calls “patterned repetitive rhythmic activities” (Perry, 2009, p. 243). These take the form of rhythmic practical life activities (such as sweeping, scrubbing, dusting, pouring, spooning, buttoning), sensorial activities (cylinder blocks), cultural activities (movement to rhythmic music), prewriting activities (the rhythmic movements involved in the insets for design and “metal insets”), mathematical activities (the rhythmic movements involved in feeling sandpaper numbers and the patterned movements involved in matching cards and counters), and language activities (the rhythmic movements involved in feeling the shapes of sandpaper letters). Many early eyewitnesses to Montessori schools commented

at length on the rhythmic aspect of the curriculum (see Phillips et al., 2022).

Thirdly, regarding the need for schools to make use of repetition in their exercises and activities, Dr. Montessori, from early on in her work, expressed her observations about the role of repetition in children’s development and learning which are similar to ideas later emphasized in the NME. For example, in 1907, when recording her initial observations in the very first Casa dei Bambini, Dr. Montessori states that “the very first phenomenon that awoke my attention” was the young child’s natural tendency to repeat exercises and activities (Montessori, 1936, p. 126). She describes her incredulity when observing a young child repeating a cylinder block 42 times. She later observed this phenomenon in children’s other activities such as hand washing (Montessori, 1936, p. 128). She further observed that following this “repetition of the exercise...the children emerged as rested, full of life, with the look of those who have experienced some great joy” (Montessori, 1936, p. 127). From this moment on, she encouraged her teachers to allow children to repeat an exercise as many times as they wished because she recognized that repetition had psychological significance and seemed to meet an “inner need” in the child (Montessori, 1936, p. 128).

Fourthly, Montessori and Perry both argue that schools need to be relevant—that is, developmentally matched to the child. Very early on in her work in the Casa dei Bambini, Dr. Montessori recognized the necessity of giving children free choice in their selection of activities to ensure that the activities were developmentally matched to the child. She wrote: “The children had their special preferences and chose their own occupations. To enable them to do so, we later provided low, pretty cupboards in which the apparatus was placed at the disposition of the children, who could choose what corresponded to their inner needs. Thus, the *Principle of free choice* accompanied that of *Repetition of the exercise*” (Montessori, 1936, p. 129).

Fifthly, regarding the need for schools to be rewarding—that is, to give pleasure and a feeling of success producing good chemical responses in the child, Dr. Montessori and Perry share a commonality. Dr. Montessori repeatedly observed that the children, having engaged in activities of their own choice which allowed them the possibility of success, and having been allowed to repeat these activities for as long as they wished without interruption, became happy and joyful, “their faces alert and joyous” (Montessori, 1936, p. 153).

Sixthly, regarding the need for schools to be

respectful of the children, their culture, and their immediate and extended families, Dr. Montessori and Perry appear to be of the same mind. Regarding the child, Dr. Montessori wrote: “The child is truly a miraculous being, and this should be felt deeply by the educator” (Montessori, 1967, p. 121). Very early on in her work with the children in the first Casa dei Bambini in 1907, Dr. Montessori became aware of the young child’s acute sense of dignity and need for respect when she noticed how they were continuously reprimanded by adults for having “runny” noses and so decided to give them what she thought was a “humorous lesson” on how to blow one’s nose discreetly. Following the lesson, the children reacted with a burst of applause (Montessori, 1936, p. 134). Dr. Montessori stated that “afterwards, through long experience, I discovered that children have a profound feeling of personal dignity. . . . I had indeed touched these poor little children in their social dignity” (Montessori, 1936, p. 135). Dr. Montessori extended this respect to the children’s immediate and extended families by such simple things as “chatting” directly with the mothers of these children (something unheard of in her day) and instructing her teachers to have weekly meetings with the mothers so that they could discuss their children together (Montessori, 1964).

How Dr. Montessori utilized “sensitive periods” in development to provide children with an educational approach that anticipates what Perry calls a “developmentally sensitive and biologically respectful approach to learning” (ThinkTVPBS, 2020a)

The third and final theme identified from the analysis of the literature relates to how Dr. Montessori utilized “sensitive periods” to support a developmental approach that anticipates what Perry calls a “developmentally sensitive and biologically respectful approach to learning” (ThinkTVPBS, 2020a).

The concept of sensitive periods in development was first postulated in biology with regard to animal life. However, Dr. Montessori had a deep insight into the existence and importance of sensitive periods in the development of the human being. She wrote, “Man’s mind does not spring from nothing; it is built up on the foundations laid by the child in his sensitive periods” and claimed to be the first to discover “the sensitive periods of infancy” (Montessori, 1936, pp. 55, 34). She regarded sensitive periods as protective factors designed by nature to aid the optimal development of the human being. She defined sensitive periods as (a) critical periods or blocks of time in children’s lives when nature directs

them to focus their attention on areas that are vital to their normal development at a specific point in time; (b) temporary phases which wane and ultimately fizzle out when children have been given enough time to master the area necessary for their optimal development; and (c) windows of opportunity for learning and development because, during each of the sensitive periods, children experience an intense and extraordinary interest in the area that nature directs them to focus on, which causes them to repeat an activity until they have mastered it. Regarding sensitive periods, she wrote:

It was the Dutch scientist Hugo de Vries, who discovered the existence of sensitive periods in animal life, but we ourselves, in our schools and by observing the life of children in their families, were the first to discover the sensitive periods of infancy, and to respond to them from the standpoint of education. These periods correspond to special sensibilities to be found in creatures in process of development; they are transitory and confined to the acquisition of a determined characteristic. Once this characteristic has evolved, the corresponding sensibility disappears. (Montessori, 1936, pp. 34–35)

Dr. Montessori identified several sensitive periods in development during the first six years of life (Montessori, 1936). She saw the importance of making use of the sensitive periods “from the standpoint of education” (Montessori, 1936, p. 34) because she believed that children would never again experience a level of interest, concentration, or devotion to a specific area that they experienced while under the influence of its corresponding sensitive period.

Dr. Montessori’s concept of a sensitive period for movement

Édouard Séguin (1812–1880), a French physician who developed what he called the “Physiological Method” of education, greatly influenced Dr. Montessori. She translated word for word the lengthy French volume of his work (Séguin, 1866). For Séguin, the importance of movement and physiological exercises as a means of reaching the brain was fundamental. In explicating Séguin’s understanding of the importance of movement and muscular education, one of Dr. Montessori’s contemporaries wrote,

The brain, the organ of the mind, is a part of the nervous system, and through this system alone can the mind of the pupil be reached. And in its turn the nervous system can be reached only through the muscles and senses; so that the education of the child must begin with the training and development of his muscular and sensorial powers. (Fynne, 1924, p. 145)

Séguin's views on the importance of movement and muscular education were in accord with best twentieth-century thought. For example, in 1904, Professor Herman Horne, the American educational philosopher, wrote:

All appeals to the mind, educational and otherwise, must be made through the agency of the nervous system. The senses on the one hand and the muscles on the other are the two first gateways through which educational influences must proceed. The educator who would climb up into the mind by some other way is unaware of the nature of the child with whom he has to deal. The training of the senses and the doing of things well that require delicacy of muscular adjustment are the two beginnings of physical education, and only a sound physical education can support a sound mental education. (Horne, 1904, pp. 61–62)

This paper argues that Dr. Montessori took Séguin's principles a step further when she added to them the power of the sensitive periods in development which promote "repetition of the exercise" (Montessori, 1936, p. 126). By utilizing the sensitive periods, with their inbuilt compulsion towards repetition, as an aid to the development of the body and the mind, Dr. Montessori was clearly promoting an educational approach that shares features similar to what Perry calls a "developmentally sensitive and biologically respectful approach to learning" (ThinkTVPBS, 2020a).

From her meticulous observations of young children, Dr. Montessori became convinced that, from birth to 6 years, all children experience a "Sensitive Period for Movement" (Montessori, 1936) which is most acute between birth and 5 years. She noticed that during this period, children are intensely interested in and focused on perfecting their movements; therefore, they repeat certain movements. Following these repetitive actions, they appear to become calm and "very happy" (Montessori, 1936, p. 127). To facilitate this sensitive period, Dr. Montessori designed many activities and

exercises involving small and gross motor movements. These activities and exercises feature prominently in the practical life, sensorial, and cultural areas of the Montessori curriculum. They also feature in the language and math areas of the curriculum, especially in activities that utilize procedural or muscle memory—that is, a type of memory that involves committing a specific motor task into memory through repetition; for example, children learn to feel sounds/numerals by repeatedly feeling sandpaper letters/numbers and so developing a muscle memory of their shapes. In all these activities, repetition is paramount, because, as neuroscience now shows us, "interventions that provide patterned, repetitive, neural input to the brainstem... would be organizing and regulating input that would likely diminish anxiety" (Perry, 2009, p. 243).

To onlookers who knew of Dr. Montessori's years of research, the science behind the genius was evident. One witness wrote:

When one visits these schools the life of the children seems so normal, so natural, and their activities at first glance so undirected, that it is easy to overlook the fact that behind all this, making it possible, lie years of preparation, of scientific training, of extensive experimentation, deep and earnest thought, reverent, unprejudiced observation. Perhaps no educator has ever approached a pedagogical experiment through such broad and remarkable training. It is characteristic of Maria Montessori's peculiar genius that her gifts as a scientist, a physician and a psychologist have always been but means through which she might help more vitally the lives of those about her. (George, 1912, p. 28)

Another eyewitness, the highly respected American Kindergarten expert Ellen Yale Stevens, wrote that Dr. Montessori "realises the plasticity of the nervous system and the importance of building into its tissues" (Stevens, 1912, p. 81). Stevens appears to be using the word plasticity as we would today—to denote the quality of being easily shaped and molded. Solange Denervaud, a neuroscientist and former Montessori educator, whose work examines the impact of the Montessori pedagogy on the neural development of the child, emphasizes the importance of neuroplasticity in childhood. Denervaud reportedly said, "brain plasticity lasts until our death. But in reality, we build our foundations during childhood" (Galitch, 2021, p. 5). By utilizing the sensitive period for movement as an educational aid, Dr. Montessori was, in

effect, utilizing the brain's capacity for neuroplasticity to the maximum.

Dr. Montessori's concept of a sensitive period for the social aspects of life

Édouard Séguin believed that social and emotional learning "affection" could be taught just as the refinement of the senses was taught:

To develop their sense of affection . . . as were developed their senses of sight, hearing, and others, does not demand new instruments, or new teachers but the extension of the same action upon their feelings. To make the child feel that he is loved, and to make him eager to love in his turn, is the end of our teaching as it has been its beginning. If we have loved our pupils, they felt it and communicated the same feeling to each other; if they have been loved, they are loving. . . . For our pupils. . . . love alone can truly socialize them; those alone who love them are their true rescuers. (Séguin, 1866, pp. 244–245)

Dr. Montessori took Séguin's ideas about social and emotional learning and built on them. From her meticulous observations of young children, Dr. Montessori became convinced that all children (from approximately 2 to 6 years) experience a "Sensitive Period for the Social Aspects of Life" (Montessori, 1936, p. 33). During this period, children are intensely interested in and focused on how we interact with and treat other people.

This paper postulates that Dr. Montessori was (and still is) unique among educators in that she used this sensitive period in children's lives to teach them how to show qualities like kindness, respect, and empathy by having children repeatedly act out kindness, respect, and empathy. She named these activities the Exercises of Grace and Courtesy. She also utilized specific collaborative activities, especially ones that involve movement, therefore combining the power of the sensitive period for movement with this sensitive period. For example, she encouraged and facilitated collaborative activities such as the carrying of tables, chairs, or large teaching materials out to the garden or preparing long tables for communal meals (Montessori, 1936). Similarly, through the Exercises of Grace and Courtesy, children embody the qualities of love, respect, kindness, empathy, and so on. For example, by teaching children the physical action of stepping aside to allow somebody to pass or of

closing the door quietly so as not to disturb others, we are, in effect, ingraining in the child's procedural memory the know-how of showing respect and kindness to others. The implications of this are immense.

It could be argued that we are laying the bedrock for preventing bullying in childhood, adolescence, and in the workplace in adulthood. It has already been shown that Montessori schools have significantly less "ambiguous rough play" than non-Montessori schools (Lillard & Else-Quest, 2006). Moreover, early eyewitnesses frequently commented on the lack of bullying in the early Montessori schools (see Phillips et al., 2022). It is arguable that this was a direct result of the emphasis on the Exercises of Grace and Courtesy which took place daily in authentic Montessori schools and enabled children to embody respect, kindness, and empathy towards others.

This approach is very different from that used in many playschools where children are constantly admonished to "share," "play nice," etc. Although these admonitions are well intentioned, they are often ineffective. The Montessori Exercises of Grace and Courtesy differ significantly in that these exercises, being made into physical actions rather than just admonitions, become part of the child's procedural memory. When children are exposed daily to patterned, repetitive exercises that embody kindness during this sensitive period when they are most open to learning empathy, the physical learning of empathy becomes hardwired into the child's psyche; it is difficult to eradicate because procedural memories are hard to unlearn (Grigsby & Stevens, 2001). This concept is important because research on memory suggests that procedural memory actually forms a person's character; these behaviors become "who we are" (Grigsby & Stevens, 2001, p. 102).

Denervaud and colleagues make some important observations on how school systems shape children's knowledge and creative abilities, which may have bearing on the topic under discussion. They write: "Children in a Montessori pedagogy are immersed in a more enriched and diverse school environment. They explore concepts through real life activities and interactions with their peers" (Denervaud et al., 2022, p. 1). She goes on to state that: "Children, by perceiving concepts and understanding more flexibly, may be more open to others" (Denervaud et al., 2022, p. 1). Perhaps we should think of the sensitive period for the social aspects of life as a period for social and emotional development because that is essentially what it is.

Dr. Montessori's concept of a sensitive period for order

The little child's need for order is one of the most powerful incentives to dominate his early life.
(Montessori, 1967, p. 190)

Dr. Montessori was convinced that there was nothing “haphazard” about the development of the human mind: “If the whole universe is governed by fixed laws, is it possible that the human mind be formed haphazardly, i.e., without any law at all?” (Montessori, 1975, p. 9). She argued that “Nature gives small children an intrinsic sensibility to order” (Montessori, 1936, p. 55) as an aid to their efforts to “construct” their own brains. It is arguable that that Dr. Montessori was (and still is) unique among educators in that she recognized and utilized the power of the sensitive period for order which promotes the repetition of orderly exercises and activities to aid children in the optimal construction of their brains, because in the larger, biologically driven picture, healthy brain development is needed for the continuation of a healthy species. She aided the development of children's sequential memory by designing curricular activities that involve order and sequencing and by laying out the prepared environment in an orderly way. The following paragraphs elaborate on these points.

Dr. Montessori's meticulous observations of children convinced her that all children experience a “sensitive period for order” (Montessori, 1936, p. 55; 1967, p. 190). This sensitive period begins at birth but is most noticeable between 2 to 4 years, often because of the distress its infringement causes to the child. It is arguably the most important of the sensitive periods and, regrettably, the least recognized or understood by parents and teachers alike. Dr. Montessori was convinced from her observations of young children that, during the sensitive period for order, nature programs young children to focus on patterns, routines, and sequences in their daily life to help them in their brain construction. Since children construct their brains from what they find in their immediate environment, it follows that if that environment is chaotic, children's brain development may not be optimal. On the other hand, if children's immediate environments are well ordered and there are no other endangering factors (such as genetic predispositions to abnormal brain development or other adverse conditions), children stand an excellent chance of having optimal brain development.

Once Dr. Montessori recognized this sensitive period for order, which only exists during the first plane

of development, birth to 6 years, (Montessori, 1971), she constructed her Case dei Bambini (Children's Houses) to cater for it by embedding order onto every aspect of the environment, both indoors and outdoors. In practice, this means that the physical layout of the prepared environments for children in this age range is meticulously orderly. For example, the materials for each curriculum area (practical life, sensorial, language, mathematics, cultural) are laid out in an orderly fashion on sets of shelves. Each set is arranged sequentially from the most basic level of difficulty to the most complex. Each child is shown from the outset how to carry the materials carefully to a mat or a table to work with them and then how to replace them on the correct shelves when he or she is finished.

Many of Dr. Montessori's contemporaries understood the groundbreaking significance of what she was doing. The assistant editor of the London Times Educational Supplement, having had talks with Dr. Montessori over the course of several months in 1919 about her method, wrote: “This is not merely a new way of amusing children—it is the beginning of a re-organization of the human mind” (Radice, 1920, p. 11). Order and sequence are to be found everywhere in an authentic Montessori environment. More importantly, this practice of sequencing is essential for the development of sequential memory, which is a vital element of healthy brain development and is particularly necessary for the development of literacy and numeracy skills.

Sequential Memory—What It Is and Why it is Impaired in Some Children.

Craig (1992) explains the importance of sequential memory, a type of memory which can remember visual and auditory input in sequence, in the learning process: “A child's successful completion of many academic tasks depends on the ability to ‘bring linear order to the chaos of daily experience’” (p. 67). She explains that in the first few years of life, sequential memory is not yet developed, and the brain records events “much like a series of snapshots that capture the essence of experience but may lack a linear sequence” (p. 67). The cognitive process that crafts these “snapshots” and into a linear sequence is sequential memory. Sequential memory is clearly not something we are born with. It is something that must be developed. Craig argues that there is a crucial need for stable, predictable, ordered environments and equally stable caregiving for the successful development of sequential memory: “The transition to sequential semantic memory is most easily made in environments marked

by consistent, predictable routines and familiar, reliable caregivers” (p. 67). She emphasizes that when these conditions are not available, sequential memory does not develop properly: “In the absence of these factors, children may continue to encode new information episodically or not at all” (p. 67).

As we know, many children do not grow up in stable environments. This is particularly true of children brought up in the care system and homes where there is substance misuse or mental health issues. In these circumstances, the threats to the development of sequential memory are serious. Craig (1992) also argues that children who grow up in homes where rules can vary according to the transient inclination of the caregiver will have difficulty developing sequential memory: “Children raised in households in which rules and routines are subject to the whim of the parent may lack the consistency and predictability required to move easily into a more sequential ordering of the world” (p. 67). This impacts both children’s ability to learn and especially their struggles to learn within a school environment that relies on sequential ordering. Craig argues that many children’s difficulties in school relate to their having what she refers to as “a learning style that is unresponsive to school environments that rely on sequential ordering” (p. 68).

How the Montessori Method Aids the Development of Sequential Memory. The emphasis on order in authentic Montessori schools, which necessarily involves carrying out activities in a sequence, leads to the development of sequential memory. For children whose exposure to a chaotic home environment has impeded the building of sequential memory, the Montessori school could be a significant aid to their development. Every activity the child engages in—whether it is scrubbing a table, washing a window, or polishing a mirror—involves a meticulously planned sequence of steps to enable not just the completion of the activity but, in the long term, to aid the development of a healthy brain. Therefore, in an authentic Montessori school, the disadvantages a child suffers from exposure to a chaotic home environment can be compensated for, daily, by the multitude of “sequencing” opportunities made available to the child through the Montessori materials and exercises.

Discussion

This paper offers a unique contribution to the field of Montessori research by comparing some of the core principles and recommended activities of the

Montessori Method with some of the core principles and recommended activities of the now-acclaimed NME. The author is unaware of any other study that does this. The paper also examines Dr. Montessori’s unique use of sensitive periods in development for educational purposes (in particular, her use of the sensitive periods for movement, the social aspects of life, and the sensitive period for order respectively) and argues that, in utilizing the sensitive periods for educational purposes, she was actively promoting an approach to human development that appears to anticipate what Perry calls a developmentally sensitive and biologically respectful model of education.

In many countries, there has been a move away from authentic Montessori practices, including the facilitation of sensitive periods. This, it could be argued, is resulting in poorer outcomes for children. Often, this is because of national policies relating to early years curricula. For example, many teachers feel they are under growing pressure to apply curricula that (a) take no heed of the sensitive periods in development or (b) trample over the sensitive periods in development—in particular the sensitive period for order, which is most vulnerable to being ignored by teachers and parents alike. Frequently, Montessori teachers feel that they have no choice here. A country’s early years curriculum is often designed by people who have no knowledge of Dr. Montessori’s discoveries, especially in relation to sensitive periods and the sensitive period for order in particular.

In addition, Montessori teachers often report that parents are often suspicious, or even afraid, of classrooms that look too structured or too tidy. Also, there may be a perception among parents that a structured classroom will not support a play-based curriculum, and so teachers are nervous of making their classrooms look too tidy or structured. Because of this, many teachers (some interviewed by the present author) state categorically but wistfully that they can no longer prioritize the sensitive periods, especially the sensitive period for order, when laying out their environments.

If the sensitive periods in development, and in particular the sensitive period for order, are a vital developmental need in children under 6 years, then it follows that failure to recognize and support sensitive periods may be a failure to meet children’s developmental needs and therefore may be harmful to children. It is vital to make teachers and the public aware of the power of sensitive periods in development for all children, especially for those with developmental problems, in a

similar way to that by which Perry is making teachers and the general public aware of the basics of brain development in children.

In conclusion, the findings of this study suggest that the NME and the Montessori Method share many commonalities. Specifically, Perry's findings in relation to the vital importance of positive relational interactions between adults and children to promote healthy human development are in line with Dr. Montessori's early emphasis on the necessity for the teacher to feel and demonstrate, in daily practice, a genuine love for the human child. The 6 R's recommended by the NME align with original Montessori principles which emphasize that the children's houses were relational, the activities were rhythmic, repetitive, relevant, and rewarding, and every aspect of the environment was respectful. This paper would argue that the neuroscience behind the NME sheds light on the early success of the Montessori Method in bringing social, emotional, and cognitive flourishing to large numbers of children. In addition, this gives reason for great optimism that the Method still has the power to promote human flourishing in our current times because Dr. Montessori's "scientific pedagogy" is still entirely replicable.

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