The Role of Movement and Sensorial Stimuli for Therapy and education. *A comparative study*

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Abstract

The following article looks at the role movement and sensorial stimuli do play in the educational approaches of Dr. Maria Montessori and Dr. Emmi Pikler as well as the Sensorial Integration and Psychomotor Therapy. The author of this paper has been studying, applying, and teaching all four approaches for many years and used her expertise in all four approaches to look at whether independent scientific research proves the effectiveness of movement and sensorial stimuli for reaching therapeutical as well as educational goals and to also provide scientific evidence for the fact that all four approaches focus on the role of these two factors, which means that this is a comparative study utilizing existing research papers.

The methods of applying movement and sensorial stimuli in the four approaches mentioned above are being compared and linked to recent scientific findings concerning the role of movement and sensorial stimuli for the efficacy of education and therapy. This article compares the four approaches based on scientific research on the various methods as well as independent research which looks and the impact of movement and sensorial stimuli as well as a method of application and its effectiveness. It has been found that sensorial stimulation and movement are closely connected and that these play a major role in all four approaches although the methods of application are quite different. One example might be that the Montessori method purposefully teaches specific movements in specific ways while only Sensory integration therapy also utilizes passive movement as a sensorial stimulation. All four approaches rely on the self-motivation of the child and do not apply any kind of pressure.

Keywords: Movement, Montessori, Pikler, Psychomotor therapy, Sensory Integration

Introduction

Due to the lockdowns in many countries of the world, which had become necessary because of the COVID19 pandemic children had been deprived of movement indoors and outdoors as well as sensorial stimuli which go along with movement in nature, on playgrounds, educational activities in kindergartens, and other childcare institutions but also with human touch and cuddling all of which had become forbidden out of fear of and infection with the novel coronavirus. Children had been locked inside their family homes and were told that outdoor activities and close physical contact with other human beings were dangerous for their health. This has been going on for around twenty months now,

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an enormously long period concerning the development of a child. Not only psychologists but also pediatricians have also started to be worried about the psychological wellbeing of the children affected (Strassburg, 2020). This was the case of the pediatrician Emmi Pikler, who developed her method of care and education during a time of health crisis and quarantine.

What is the rationale behind the choice of the two domains of comparison movement and sensorial stimulation?

The senses are highly specialized information organs that enable human beings to orientate themselves purposefully in their environment. The healthy development of a young child is guaranteed by well-dosed stimulation by what the child finds in his environment. This movement plays an important role, as it enables a wide range of sensory stimulation. In addition, the types, and extent of perception of visual, auditory, tactile, gustatory, olfactory, proprioceptive-kinesthetic, and vestibular information obtained does influence how a child moves. Therefore, movement and perception are mutually dependent (Schwarz; 2014).

On the other hand, perception does influence the ability to grab, crawl and thus develop cognitive functions and the relationship to the social environment. For toddlers' movement does not just comprise changing their location but also obtaining socio-emotional information. The better the senses are being developed, the easier the child can decode the communication transmitted by movement (Schwarz; 2014). Sensory signals control motor pathways, maintain stability on movement, irrelevant stimuli are being filtered out and relevant stimuli are enhanced all this clearly show how much-coordinated movement does depend on constant interaction between neuronal circuits which produce motor output and report sensory consequences (Azim & Seki; 2019)

Based on the above explanation, movement, and sensorial stimulation condition each other, therefore these two interwoven systems have been chosen as one topic in this article.

What is the rationale behind the choice of comparing Montessori and Pikler education with Sensory Integration and Psychomotor Therapy?

Montessori education had been developed in a time where the only acceptable activity for children was to quietly sit on a chair and yet Dr. Maria Montessori (1870 – 1952) found out, that both sensorial stimulation and physical activity are tremendously important for education as well as a healthy development of any child (Vacarciuc & Iulic; 2020). Dr. Montessori, a psychiatric pediatrician first developed her method to train her patients at the pediatric psychiatric hospital in Rome, later further developed and refined her method working with socially disadvantaged children before applying it to children from regular, well-educated, or any other backgrounds around the world (Vacarciuc & Iuli; 2020). Today the application of the Montessori method for children with special needs is commonly referred to as Montessori therapy while the application for regular classrooms is being called Montessori education (Nehring; 2017). It is interesting to note,

that the same materials and methods are used for both applications. This well-established method is used for rehabilitation for elderly and stroke patients and reading and writing classes for illiterate adults as well. What makes this method remarkable is, that it not only stimulates the senses, encourages, and teaches movement but that academics are being taught using movement and sensorial stimuli.

Many A few years later Dr. Emmi Pikler (1902 – 1984), an Austro-Hungarian pediatrician, who was developing her method in the middle of a tuberculosis epidemic, was able to show how children need free movement for healthy development and how intensive contact during care activities brings peace and quietness to the children and their behavior. The children she and her nurses took care of from 1946 at the children´s home in Budapest were children, who had been taken from their families to keep them safe during the tuberculosis epidemic in Hungary after World War II. They had mothers or other close family members in the same households who suffered from this contagious lung disease, some of their parents died because of this infection, which meant that these children were suddenly deprived of their family environment, not understanding why, and sometimes could not return as their guardians had passed away. Today, in a situation quite like the situation then, childcare professionals do everything possible to avoid close contact. Then close contact, without masks or gloves was the chosen method to help the children overcome their trauma. What makes this method so remarkable is the fact that none of the children taken care of at the Loczy, as this children´s home was called ever suffered from hospitalization despite the trauma of being removed from their parents by force, taking care of babies and toddlers up to only three years old.

Both Dr. Maria Montessori and Dr. Emmi Pikler were medical doctors, specialized in children, as has been mentioned earlier and their scientific training motivated them to meticulously document their “cases”, the children´s progress, development, and which methods they had applied to help the children develop. All methods of the Pikler approach closely resemble the Montessori approach for children 0-3 years old. The difference is, that Dr. Montessori developed her method for children and youth from 0-18 years, while Pikler only worked with babies and toddlers up to their third birthday, children who were taken care of after their third birthday were a rare exception (Redman, et al; 2021).

Sensory Integration Therapy consists almost purely of strong sensorial stimulation, especially of the close senses as well as active and passive movement. Sensorial Integration therapy is based on the fact that sensorial stimulation causes a neurological reaction. Jean Ayres said 1972 that “sensory integration” is a neurological process that structures and organizes stimulation from the surroundings and someone´s own body and enables a person to act and interact effectively within his or her environment using his or her body effectively. Jean Ayres who developed SI was trained as an occupational therapist, later studied psychology, and did her post-doctoral degree at the UCLA brain research institute (Ayres, 2013).

Psychomotor focuses on a large variety of movement activities but also uses sensorial stimulation through objects like balloons, newspapers, mats, blankets, and many more. It highlights the connection between body, soul, mind, and neurological system. Several branches of psychomotor therapy have developed at the same time in several countries by several different personalities. It is an educational as well as a therapeutic approach (Probst, et al; 2010).

Two famous educational approaches and two important therapeutic approaches (the Montessori method is both an educational and a therapeutic method, depending only on the application) focus on movement and sensorial stimulation as means for promoting child development, education, and therapy, therefore these four well-known methods are being compared concerning their approaches, methods, and outcomes.

Yet what is the rationale behind the choice to compare these four approaches in one article?

The first reason is that in today's world educational specialists generally have a very narrow focus on only one method and very often even one aspect of a certain method, which allows very close and deep research of each aspect which might help children to develop well. Yet focusing on only one particular method or one detail bears the danger of loose the overview, this is why this article tries to create an overview, which has never been looked at before in this way.

Different highly motivated educators developed different methods to help children facing various challenges in many countries over one hundred years.

What can we learn from these approaches?

Are they distinct methods for distinct issues or do the four approaches share a common methodology?

All four methods have been developed to help children facing challenges, as do children these days who have been deprived much of the important stimuli crucial to healthy development, all four methods put a strong emphasis on movement and sensorial stimuli, therefore the author chose to refocus on two aspects of healthy child development based on four popular, well-known approaches.

The Role of Movement and Exercise

Introduction

All four approaches discussed in this paper see movement as a major instrument for the education and therapy for children.

Free choice and free movement are the main values concerning movement in Montessori as well as Pikler education and psychomotor therapy. All of them believe that children do develop all gross motor skills naturally if allowed to move freely without external interference. The condition, therefore, is a safe, prepared environment, which allows children to move freely concerning the amount and types of movement. Keys for this are the preparation of the setting, self-motivation, and enough time for daring to try out new forms of movement.

2019 Lucká wrote (Lucká, 2019) about the importance of a multi-sensory environment for psychomotor intervention and how this is an increasingly often used strategy as it is not only useful for tactile integration, supporting dynamic locomotion, increasing the memory and sensory processing as an important basis for practice (Lucká, 2019; Ayres, 1996)

This also shows how deeply psychomotor therapy and sensory integration therapy are connected yet Lucká also says that a multisensory environment can be widely used for various therapeutic interventions (Lucká, 2019). This shows how the principles of the importance of movement and the prepared environment are interwoven and how important the role of movement is for the development of most other abilities.

The role of movement for the Pikler educational approach

Dr. Emmi Pikler did herself carry out rigorous scientific research into the natural gross motor development in small children – highly likely unique of their kind in the whole world. (Marlen, 2017).

Dr. Emmi Pikler discovered due to her exceptional observational competencies, that well-intending adults all too often intervene in the motor development of the children they are responsible for, instead of allowing them time and opportunity to freely unfold the motor competencies at the time they naturally would (Marlen, 2017). Dr. Emmi Pikler discovered that the development of the motor abilities of a healthy child is an integral part of the general development and does go along with great changes in somatic as well as psychological development (Pikler, 1968) These findings are also an explanation for the effectiveness of psychomotor therapy, which means that Dr. Emmi Pikler discovered the scientific foundation for psychomotor therapy before it had been developed, which is another proof for how much Pikler education and psychomotor therapy are being connected.

Yet there is not yet any study concerning how the application of the Pikler educational approach might reduce the need for PMT interventions or how early and proper application of the Pikler approach could replace PMT.

Another important principle of the Pikler approach is that the gross motor and the fine motor development are closely connected and the one cannot develop without the other (Marlen, 2019), which is an equally important fact for psychomotor and sensory integration therapy but also known and considered by Montessori educators. Marlen (2019) says that future health, cognitive function, emotional and social development depend on the physical activity and lifestyle during early life (Marlen; 2019) This is another common fact between psychomotor therapy and the Pikler approach. Another one is, that no developmental step must be skipped or forced upon (Marlen; 2019). Eager, overly motivated parents and educators continue to try teaching motor patterns to children that they are not yet ready to acquire. This does them great harm in several ways, one of which is that they experience pressure concerning their development, another one is that the steps which have been skipped

cannot easily be developed later and that adults with such attitudes find it unnecessary for these children to do the “easy” things.

For the approach of Dr. Emmi Pikler, it is essential that the development of movement comes naturally and the children's voluntary exercise. Yet it is important to know that, that this can and will only happen if the child has enough occasions to exercise concerning time, space, and safety. The same applies to psychomotor therapy. Which role does the natural evolution of motor skill play in the extraordinary positive psychological success of the Loczy has never been subject to research?

The role of movement for the Montessori method

The Montessori approach has a twofold strategy concerning movement. One is to let children move freely in a prepared environment just as Emmi Pikler suggests, the other is to purposefully teach precise gross and fine motor skills and to also teach them motor control. This means that Dr. Maria Montessori goes further in her motor interventions and offers different approaches for various age groups and issues. As Dr. Maria Montessori first developed her method for children who didn´t have any possibility to move freely but had been restricted in many ways from movement, she needed to find ways to overrule this lack of development during the early years. Dr. Maria Montessori developed ways to purposefully teach children even the simplest kinds of gross and fine motor movement, like walking, standing up or sitting down, pouring, spooning, sieving, or drawing in organic and graceful ways. She says to divide the movements into smaller potions which can be more easily followed and learned by the child.

This twofold strategy can also be explained as the Montessori approach is being used for special needs children and as well as for children with regular development and highly gifted children and has specific curricula for various age groups from 0-24 years, while Dr. Emmi Pikler mainly worked with children 0-3years old.

2019, Patten and Bodden published a study on the influence of physical activity on the level of concentration as well as the ability to freely choose one´s activities which is one of the main requirements for a Montessori classroom (Patten & Bodden, 2019).

The outcome of Patten and Bodden´s study (2019) explains that one of the main principles of the Montessori approach, the free choice of activity depends on the amount and character of physical activity in general, which at the same time makes it clear how crucial the role of movement is for the success of the Montessori method. It also proves that the needed concentration for the educational activities is an outcome of the amount and quality of physical exercise offered.

Yet the study of Patten and Bodden (2019) also explains the lack of concentration and ability to decide for activities in regular classrooms. Would the amount and quality of exercise be increased; concentration and motivation would automatically increase.

According to Maria Montessori, it is the movement that supports the development of intelligence, while intelligence is being responsible for guiding movement. Body

coordination is a direct goal of various Montessori activities. Dr. Maria Montessori also describes movement as a creative process that is being driven by internal motivation. It has been found that children enjoy various balancing activities, do them motivated internally, and are deeply content when they control their movements. This requires coordination of all body parts and the brain. To acquire body, control much repetition is needed, which explains why Montessori emphasizes the importance of movement and exercise over and over. Walking the line and silence games are common activities for the acquisition of this much-needed coordination. After the acquisition of body coordination, activities like playing musical instruments, arts, crafts, and various types of sports become much easier. (Vatansever & Ahmetoğlu, 2019). This is one point where Emmi Pikler and Maria Montessori are in line, body control develops naturally at its own pace.

The role of movement for SIT

Sensory integration therapy is based on two pillars sensory stimulation and movement. These are often combined especially when it comes to the stimulation of the vestibular and proprioceptive system and serve to provoke the development of brain synapses.

2018 a study was done in Korea. Children aged 3-5 years old, who had previously never received sensory integration therapy and who had been diagnosed with mental disabilities, participated in the study on the impact of sensory integration therapy, and it was found, that they tremendously profited from the therapeutic approach as their fine and gross motor competencies significantly improved (Choi & Kim, 2018). The meaning of this result is that the ability for physical activities was being improved and it can therefore be said that SIT is a good choice when the fine and gross motor capabilities of children with mental disabilities need improvement.

Functioning sensory processing is the prerequisite for gross and fine motor abilities. SIT is needed when the ability of sensory processing is impaired and therefore is the main pre-condition for children to work in the Montessori environment as has been shown before.

It should be mentioned that movement is part of the therapeutic methods, yet in this study, the therapy increased the physical abilities, which might lead to further sessions of SIT, which might eventually lead to further improvements. Both gross and fine motor abilities are crucial to allow persons with mental disabilities as much independent action as possible. This significantly improves their happiness and contentment; therefore, the greatest possible independence must be a main therapeutic and educational goal throughout their lives. Another aspect is that a greater ability to move increases the possibility for physical exercise which is important to maintain physical health. Increased gross and fine motor abilities also increase the chance for useful activities, like work, crafts, and the like. Increasing motor abilities serves for an improvement of the quality of life for persons with mental disabilities.

An interesting study was done in China, where the effects of sensory integration training and physical exercise intervention on the behaviors and quality of life of children

with autism have been studied. It has been found that the intervention with sensory integration and exercise showed measurable and statistically relevant effects on the autistic behavior measured with CARS and ABC scores. XU and his colleagues said that their findings may develop future education and treatments for children with autism spectrum disorder (Xu et al., 2019). This revolutionary study should be widely advertised and used for dealing with children with ASD. Autistic behavior is what makes it hard to integrate these children as they are often ridiculed, and teachers find it hard to deal with these special behavioral patterns. As it has been proven now, that SIT combined with physical exercise can reduce these, this approach should be widely applied.

Sensory integration therapy also deals with proprioception and praxis. For these to work properly it is crucial to obtain accurate information from the sensory systems and then to organize and interpret this acquired information efficiently and effectively. Gross, as well as fine motor coordination issues, are widespread when the above three systems are dysfunctional which may result in language delay and academic underachievement. (Hatch-Rasmussen, 1995). Knowing all these proven facts, sensory integration therapy should be made easily available for all children from an early age, to minimize underachievement in many different areas.

Many studies show how effective sensory integration therapy is for children with ASD and how great the role of coordinated movement is for the wellbeing of persons with ASD.

A Chinese study found that the absence of enough physical outdoor exercise as well as breastfeeding positively correlates with SID and that taking care that children are being breastfed and get enough outdoor exercise reduces the risk for SID. (Liping et al., 2000). After the COVID19 pandemic, these findings become more relevant than ever before as children have been suffering from a lack of sensory stimuli and outdoor exercise due to multiple lockdowns, the negative results could be minimized through the application of SIT.

It has been found that the attention span of children with infantile hemiplegia could also be significantly increased through sensory integration therapy. (Kashoo & Ahmad, 2019). Which another hint for how widely SIT can be applied for the improvement of concentration in children, which is one of the issues of children in today's world.

The role of movement for PMT

Psychomotor therapy uses a large variety of physical activities to improve movement, conduct as well as psychomotor functioning concerning cognitive, emotional, and relational aspects. (Probst, 2017) This can be summarized by saying that psychomotor therapy works with various kinds of movement to improve all other functions and competencies and is therefore being embedded in various psychotherapeutic approaches. (Probst, 2017)

Tailormade psychomotor intervention demands thorough previous assessment and screening. This enables the therapist not only to plan the intervention but also to evaluate and document the progress being made by the client (Santos, 2017).

Another interesting study on the effect of psychomotor therapy was conducted the same year and was able to show the positive effect of psychomotor therapy on school children diagnosed with intellectual disabilities, showing significant delay in motor growth due to lacking static balance and therefore limited function level. Psychomotor therapy had been chosen due to its known efficacy on locomotion and the children´s personalities. (Fotiadou et al., 2017)

Psychomotor Therapy is one of the main approaches for persons with intellectual disabilities being applied in Portugal. The therapist participates in an interactive and supportive way (Santos, 2017). The question of why PMT is more widely used, than SIT or other therapeutic approaches has not been answered yet. One possibility might be that PMT is relatively cheap and can be offered in almost any location with no special requirements but the knowledge and skillfulness of the therapist.

Bearing this fact in mind would be a good reason to train psychomotor therapists in countries that do not have a developed system of diagnosis and therapies for special needs children yet or where such therapies are too expensive for most parents to afford. These therapists could be employed in hospitals, kindergartens, schools, and other centers of influence where children can be met. Children may be helped to develop much-needed abilities which may help them to learn lead independent lives.

Conclusion of the role of movement for the four approaches

It can therefore be concluded that it would be most profitable, if all SEN and other teachers, as well as all therapists, can learn to apply all the different approaches to supporting the development of the gross and fine motor functions so that each of them can support each child individually in the best possible way. It has been seen that movement needs to be allowed and promoted for which the setting must be well prepared. It has been seen too, that sensory stimuli help to develop motor functions and that motor skills can be taught purposefully too. All these factors apply to all children, whether they develop well, at a slow pace, or are diagnosed as having special needs. Movement is an educational and therapeutic tool, which has proven to be effective for the general, somatic, and psychological development as well as the development of perception, cognitive functions, concentration, contentment, and self-control.

The paper by Fabri and Fortuna (2020) presents Dr. Maria Montessori as a person and underlines that her child-centred method of education is based on extraordinary intuitions as well as thorough empirical research, which were all proven to be fully valid by neuroscientific studies many decades later, such as the three main sensitive phases in a child's psychobiological development; the important role of the environment in helping cerebral development and supporting learning, as well as of effective stimulation in psychological growth and maturation; the specific neuronal structure of humans which

especially enables the acquisition of language; the paramount role of fine object manipulation for the neuropsychological development, as well as of physical exercise in the brain and nervous system development. Physical exercise for the good and wholesome development of the brain and nervous system also plays an extremely important role in the Pikler method, the sensory integrations therapy as well as of course in the psychomotor therapy, where is one of the pillars.

It can therefore be regarded as proof that all four approaches do enhance the motor abilities and praxis of children either by preparing the conditions for them or by directly training them who are taking advantage of any of the four approaches. Whether they do this by allowing free movement, provoking new forms of movement, combining movement with sensory stimuli, or by purposefully teaching natural and needed forms of motor abilities, the results are more skillful, better planned, and coordinated as well new forms of movement.

The question which remains unanswered is whether a combination of all four approaches would further increase the motor abilities and praxis of children.

No research has ever been conducted to investigate this question. The author of this paper assumes that this would the case. Working with physical exercise does also positively influences other abilities as well as the behavior of the participating children. Again, this applies to all four approaches, and it has never been tried to combine the four approaches to obtain even better therapeutic results.

PMT is a form of therapy that is normally used only by therapists but as the benefits for child development and education have become known to teachers, it is increasingly applied by kindergarten teachers in regular kindergarten settings. This is an example of how methods from all four approaches can be applied by regular teachers who are being trained in short adult education courses and how this is for the benefit of the children who take advantage of such efforts. Such training courses for SI, PMT, Pikler, and Montessori education could be increasingly offered to willing childcare workers to continuously qualify them for supporting all children, especially SEN children.

The role of Movement and how it is used to obtain educational goals	**Pikler Education**	**Montessori Education/Therapy**	**Sensory Integration Therapy**	**Psychomotor Therapy**
Applied by therapists during therapeutic sessions		✓	✓	✓
Applied by teachers and childcare workers in kindergartens and childcare institutions	✓	✓	Methods from SI are being applied by regular teachers and childcare workers, yet not in the sense of a therapy	✓
Free movement is a main principle	✓	✓	✓	✓
A condition and prerequisite for general development and all learning	✓	✓	✓	✓

A main educational method	✓	✓	✓	✓
A crucial purposeful therapeutic method	Rarely used for therapy although it would be very fit for it.	✓	✓	✓
Application for SEN	This approach is rarely used for working with SEN kids as diagnoses are often not made that early and the strengths and potential of this method for SEN toddlers have not been recognized by special education specialists yet.	✓	✓	✓
Application for all children	✓	✓	SI is generally used only for SEN children, although it could be applied for any child to enhance healthy development, especially in these times of a worldwide pandemic, where children are being deprived of their regular activities and environments.	✓
Certain movements Purposefully taught	No	✓	no	no
Organized training for all children of a group (all must move together, like a gymnastics lesson)	No	no	no	no
The teacher or therapist meticulously demonstrates a movement, and the child/children have to copy the movement demonstrated	No	Many practical life activities are being taught that way	no	no
Passive movement is used as a crucial method	No	no	✓	✓
Special equipment and materials for various types of movement are being purposefully provided	✓	✓	✓	✓
A safe prepared environment appealing to active, explorative movement is being purposefully provided	✓	✓	✓	✓

The Role of Sensorial Stimuli for Education and Therapy

Sensorial stimulation starts before babies are being born, they are naturally surrounded by divers, constant sensorial stimulation due to the movements of the mother, the smallness of the uterus, and the amniotic fluid. Infants who are born prematurely are being deprived of prenatal sensory stimulation in the womb which is crucial for the normal development of the baby. Sensory stimulation in the NICU cannot by any means replace the presence of the mother and family yet it does help to reduce the negative effects of the deprivation (Vitale et al., 2021) This paper shows how essential sensorial stimuli are for the regular development of even premature babies, how much more are these crucial for older babies.

SIT is the most prominent, yet not the only approach that does use sensorial input as a crucial method for supporting children. One group of children which can be supported very well by the application of sensorial stimulation is children with Trisomy 21. It could be shown that sensorial stimulation is extremely effective when applied for these children concerning overall as well as motor development (Angel, 2019)

Recently it has even been studied whether multisensory stimulation can help kids who use automatic learning techniques and found that it does (Guachun-Arias et al., 2020)

The gustatory sense is often not being considered important enough although all human beings enjoy dynamics of the human brain processing of information coming out from the gustatory system. The gustatory sense does play an important role concerning healthy nutritional habits and behavior. The processes going on in the brain when food is being tasted has been studied and it was found that just the gustatory sense does start an enormous mechanism when being stimulated (Di Flumeri, et al; 2017) although the tongue, which is the organ where the sense of taste is located is very small its stimulation does affect large territories in the body system (Di Flumeri, et al; 2017).

All the above do allow the conclusion that each sense and its stimulation does affect the whole physiological and psychological system.

The Role of Sensorial Stimuli for the Pikler Approach

The Pikler approach, among the four approaches discussed in this paper, seems to focus the least on sensorial stimuli but this is a wrong first impression. Closely considering the principles and methods applied in the Pikler approach, much sensorial stimulation is being found. At first, there is a close connection to the caregiver during caring activities, there is a lot of human touch and closeness happens, which is sensorial stimulation. Secondly does the free movement of the infants offers a lot of sensorial stimulation by the ground the children move on, the hindrances they must climb over, the surfaces they touch, and so on. And finally, the babies and toddlers playing by and with themselves do experience sensorial stimulation by experimenting with their body parts, playing with their toes, putting safe materials into their mouths, and much more. The only difference

to the other approaches is, that all of this has not been specifically described as a sensorial stimulus, neither has there ever been given specific instruction and how to apply sensorial stimulation, because the focus has been different.

The Role of Sensorial Stimuli in the SIT

For the concept of SIT, the role of sensorial stimuli for all senses including the vestibular and proprioceptive sense is the main approach and key to its proven efficacy. Sensorial stimuli provoke brain development, and this opens the way to significant improvements in many different areas, depending on the developmental delay of a child. An example may serve a study with children diagnosed with Trisomy 21 conducted during the year 2019 which showed significant improvement in psychomotor components after only eight months of therapy (Anghel, 2019). The study showed measurable improvements in many aspects of the children´s motor abilities such as coordination, force, speed, general dynamic coordination, spatial orientation, equilibrium, and dynamic hand coordination (Anghel, 2019). These are all very crucial aspects which enable the children to move around by themselves safely and to perform various activities.

The Role of Sensorial Stimuli in the PMT

As PMT and SIT resemble each other very much, the role of sensorial stimuli for the success of the method is partly similar, the difference between the two approaches being that PMT focuses more on locomotor activities. Yet experiencing different textures and other qualities of various materials do play a prime role during psychomotor therapeutic sessions, whether these are being conducted by psychomotor therapists or regular teachers. This may explain why the outcomes are often reported to be very similar.

The Role of Sensorial Stimuli in the Montessori Approach

The role of sensorial stimuli for the efficacy of the Montessori method is decisive. Many methods used in the Montessori educational method very much resemble SIT, especially those for younger or SEN children only that the Montessori method does go much further by using sensorial stimuli even for teaching academics, like reading, writing, calculation, geography, and much more. This is a crucial aspect, which is one key to the enormous efficacity of the Montessori education both in SEN and regular classrooms, as well as in classrooms for highly gifted students, which according to contemporary pedagogy are also considered to be part of special education.

The Role of Sensorial Stimuli in the four approaches

As has been shown above, the role of sensorial stimuli for the success and efficacy of the therapy and education according to any of the four methods cannot be overestimated whether it is done purposefully and planned with the focus on the sensorial stimulation as in SIT, PMT and the Montessori method or whether it happens as an integral part of the approach as in the Pikler approach. Looking at the common points of all the research

overviewed in the literature review, it can be said that all therapeutic and educational methods which are effective do have a focus on sensorial input and sensorial stimulation has been proven as one main means of success.

How and why is sensorial stimulation being applied	**Pikler Education**	**Montessori Education/Therapy**	**Sensory Integration Therapy**	**Psychomotor Therapy**
Applied by therapists during therapeutic sessions		✓	✓	✓
Applied by teachers and childcare workers in kindergartens and childcare institutions	✓	✓	✓ Methods from SI are being applied by regular teachers and childcare workers, yet not in the sense of a therapy	✓
Specific materials are purposefully provided and prepared	✓	✓	✓	✓
Focus on all senses	Focus on touch, proprioception, vestibular sense	✓	✓	Focus on touch, proprioception, vestibular sense
A safe, nurturing environment is purposefully prepared	✓	✓	✓	✓
Sensorial stimulation is being combined with movement	✓	✓	✓	✓
No activity is being on a child	✓	✓	✓	✓
Being exposed to sensorial stimulation is regarded as a therapeutic or educational method by itself	✓	✓	✓	✓
Combination of sensorial stimulation and movement	✓	✓	✓	✓
Well developed didactics of sensorial training, senses are being refined step by step		✓	✓	

Conclusion and recommendations

It could be shown that the application of both movement and sensorial stimulation in all four approaches is scientifically proven effective for reaching set educational and therapeutic goals. The first recommendation, therefore, is to not stop or hinder the application of these outcomes as this will cause damage to the development, therapies, and education of children.

The second recommendation is to teach the application of these methods to as many childcare workers and teachers so that they can apply these for the benefit of children continuously.

Another conclusion of this article is that as four known approaches use sensorial stimulation and movement as main instruments and this has been proven effective, movement and sensorial stimulation should be focused on in every educational or therapeutic setting as this may result in teachers and therapists reaching their goals faster and more intensively.

This suggests that the ideas, materials, and methods of all four approaches should be freely combined for the best possible effects on the development of the children cared for. This suggestion includes the proposition that specialists of each approach should be working together to obtain the greatest possible efficacy. Around three decades ago, the municipality of Vienna/Austria encouraged this on a small scale which had great results but unfortunately, these efforts were neither documented nor studied. Children who were being treated with SI got the opportunity to get additional support in a Montessori playgroup, once a week. The author of this article worked with several children and their mothers who got both forms of therapy, SI and Montessori therapy, each of which once a week for one hour. These children suffered from various disorders as sensory integration disorder, autism spectrum disorder, and hydrocephalus. As it has been mentioned before this wasn´t scientific research as there was no control group, the number of children was too little and it happened around 27 years ago, yet it needs to be mentioned that this had been the first motivation to study a multimethod work approach. The author saw that the joined approaches encouraged the mothers as they saw and felt that much was done to help the development of their children. The mothers also reported that as the two approaches SI and Montessori therapy worked with the children from different angles, they believed that the joined efforts of two approaches at the same time were much more effective than just one of these could have been.

In today's educational and therapeutic world, a combination of the approaches compared in this article may look like the following two examples:

Children who are facing various challenges could be oriented to Pikler or Montessori childcare institutions as these are prepared to work with children who are having special educational needs. It would be good if these childcare centers had additional offers like PMT, either provided by trained teachers or by specialists coming to these institutions once per week to offer additional methodological approaches. Depending on the

challenge or disorder, SI should be given to the children on an individual basis based on a qualified diagnosis. This could be inside or outside of the childcare institutions.

Another way would be to train childcare workers in the Montessori and Pikler approach, depending on the age of children they are working with, and to prepare educational settings according to these approaches. This would enable childcare workers to work on developmental delays effectively as soon as they recognize them, instead of waiting for parents to organize appointments in clinics which generally takes a lot of time. Mobile specialists like PMT or SI therapists could be hired by the department of early childhood education who is supervising the childcare institutions and may be requested for children who show developmental delays according to the observation of the responsible educational personal. With only little administrative effort within a short period after the request children could receive the therapeutic support they need, the only condition being, that the child is taken care of in an official childcare institution, which most children in many countries worldwide are.

In both ways, children would receive developmental support much faster and much more effectively than in the way this functions in many European countries today, where the burden to find an institution who may do a proper diagnosis, an appointment in such a clinic, a therapist who may do the therapy and all around it by themselves. Additional hindrances are, the shame of most parents having a child who does not develop accordingly, the understanding of what needs to be done, the language barrier for many immigrated parents all over Europe, and the long waiting lists in clinics for such children as well as the lack of therapeutical spaces and the long working hours of the parents which hinder them from bringing their children to therapies regularly, as clinics are open hen most parents need to work.

The last recommendation, based on the findings of this article is, that nothing should prevent teachers or therapists from using the best possible method.

A recommendation for future research is to study how the pedagogical and therapeutic outcome of every single approach may be enhanced by combining it with one or two of the other approaches.

List of Abbreviations

ABC: Autism Behavior Checklist
ASD: Autism Spectrum Disorder
ADD: Attention deficit disorder
ADHD: Attention deficit hyperactivity disorder
CARS: Childhood Rating Scale
NVC: Nonviolent Communication
NICU: Neonatal intensive care unit
OT: Occupational Therapist
PMT: Psychomotor Therapy
SEN: Special educational needs
SIT: Sensory Integration Therapy

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