MEDIATED LEARNING EXPERIENCE:

INTERNATIONAL PRACTICES AND ADVANCES

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Refael Feuerstein

Introduction

B"H

Between the previous issue and the current one, we unexpectedly lost our dear colleague and partner, Professor Louis (Lou) Falik, of blessed memory. It is difficult to speak of Lou in the past tense—his vigorous activity and his writing, which could not always keep pace with his flow of ideas, were a phenomenal presence. The deep connection between him, Professor Reuven Feuerstein, and myself gave birth to significant scientific and literary enterprises, including the publication of revised editions of classical books: "Instrumental Enrichment," "Dynamic Assessment," and the classic guide for parents—"Don't Accept Me as I Am"—among many other books and articles. Lou was also a gifted teacher who saw his teaching as a mission to spread ideas, often without financial compensation, driven by a sense of purpose and recognition of the supreme importance of Feuerstein's theories and practices. It is difficult to describe the global Feuerstein movement without Lou's leadership. We are fortunate that an article by him, co-authored with Kathleen Bellanca, appears in this issue.

This article by Falik and Bellanca serves as a challenging complement to the surprising and refreshing article by **Oon Seng TAN & Teresa Wai See ONG: "Feuerstein's Theory and Well-Being for Children: A Cognitive and Social Integration Model"** that opens the third issue of our journal. This remarkable article transforms Feuerstein's Mediated Learning Experience theory into an educational roadmap within Singapore's national framework. It seems to me that this represents a bold attempt to translate a theory often perceived as interpersonal or school-based into a system of principles that can shape multi-age educational spaces for an entire nation that serves as a global model and exemplar of educational success. After an illuminating analysis of the challenges and values guiding Singapore's educational and care ecosystem, they present MLE theory as this roadmap, ensuring that the goals set before Singapore's educational system are met.

To this end, the authors propose a translation of the three essential parameters for mediation formulated by Feuerstein into a parallel conceptual system adapted to Singapore's educational-family ecosystem. Their proposal to translate the concept of 'intentionality' in mediation to 'presence' is particularly striking and thought-provoking. The subtext reveals the authors' great concern about the weak and insufficiently meaningful interface between parents and children against the backdrop of the heavy professional burden placed on parents and the dominance of screens over children's attention. The call for 'presence' in the sense of 'being there' by parents and educators constitutes a challenging appeal.

It seems that the article by **Louis H. Falik ל"ז & Kathleen Bellanca: "Mediating Past the First Level of Resistance,"** which adheres to the original conceptual framework of mediation parameters {intentionality and reciprocity, transcendence, and meaning}, serves as a complement to the article by **Oon Seng TAN & Teresa Wai See ONG** in that it emphasizes the energetic aspect of 'intentionality' in mediation that constitutes a focus for the 'presence' parameter. 'Intentionality,' as the authors emphasize, is a necessary condition for breaking through the resistance of the child or any mediation recipient to open up to the mediational process. The authors describe various types of resistance that emphasize the need for a calculated and intentional approach to penetrate the message into the blocked or semi-blocked cognitive system. Here, Falik and Bellanca argue, the presence of the mediator in the child's life, and even their meaningful presence, will not be sufficient to deal with their overt or covert resistance. Or perhaps **Oon Seng TAN & Teresa Wai See ONG** believe that meaningful presence itself has the power to penetrate the message to the mediation recipient—this certainly provokes discussion and future thought.

The final article by **Umberto Castiglione: "Metacognitive – Music – Motor Training"** is also refreshing and innovative. It joins various works written previously about the connection between music and MLE theory, but here we are presented with an organized methodology and a structured, reasoned action plan for using music in a mediational and metacognitive manner. As someone who had the privilege of hearing the author's lecture at the Shoresh 2024 seminar in Prague and witnessing a demonstration of the method, I could see that it is both profound and elegant and practical. After all, every program is ultimately measured by these two parameters: depth and applicability. The program strongly emphasizes an aspect that Professor Feuerstein

highlighted, which he called 'practical intelligence.' Feuerstein's 'Instrumental Enrichment' program is based on the understanding of the importance of mediation during performance, which has neurological and cognitive effects.

Before us lies an interesting journal that broadens horizons and is certainly challenging and invites discussion and thought. I would like to thank the Editorial Committee, and especially the Chair of the Editorial Committee, Alex Kozulin, who invested his talent and time in producing this journal.

Refael S. Feuerstein
Editor

Feuerstein's Theory and Well-Being for Children: A Cognitive and Social Integration Model

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Within the theory of mediated learning experience by Feuerstein, there are 12 parameters in of which three are deemed as necessary while nine others may or may not be present depending on the context. This article focuses on bridging the three necessary parameters — (i) intentionality and reciprocity, (ii) mediation of meaning, and (iii) transcendence — within the early childhood educational landscape in Singapore. The three parameters are reconceptualised as 3P: (i) presence, (ii) purpose, and (iii) propagation. Based on the 3P concept, we elaborate by bringing out the richness of early childhood aspects, including emotional, social, and biological components, in relation to children's well-being in the 21st-century knowledge-based and digital era. The elaboration helps to provide an enriched model for parents and preschool practitioners to reflect on their facilitating and mediating roles as well as their roles in designing the future learning environments for the upbringing of children.

"Change that is structural will affect learning and behaviour in deep, sustaining, and self-perpetuating ways."

(Feuerstein et al., 2010, p. 13)

1 Introduction

The mediated learning experience theory (MLE), developed by Reuven Feuerstein within a historical, social, and cultural perspective, has transcended time and geographical boundaries. Today, it is widely applied in different fields, ranging from psychology to education. While this embrace of the Romanian-Israeli's psychologist theory is the cause of celebration, many scholars continue to stress the lack of its application to contemporary psychological research. We, however, believe in the broader application of MLE theory, seek to inspire interdisciplinary conversations, and encourage scholars to engage in the theory and consider its relevance to their field of research. With this intent in mind, we do not limit our discussion to one particular aspect of Feuerstein's MLE theory. We intentionally organise our research by reconceptualising the three essential components of MLE to apply it to the early childhood education scene in Singapore.

To assist our readers, we begin by briefly introducing Singapore's early childhood education landscape and its relevant guiding frameworks. We continue by addressing why the MLE theory has had a significant influence on the way it can be understood today. We suggest that the three essential components of MLE need be reconceptualised to fit into the broader scope of today's research that is governed by fundamental research questions on the nature and development of the human mind. To this end, we elaborate the reconceptualization with examples based on Singapore's context of home, preschools, and child care centres, and conclude with moving forward comments pertaining to the applications of MLE theory related to ongoing interventions and policy work.

2 Early Childhood Education in Singapore

Singapore's education system, from primary to tertiary level, has always attracted global interest, owing to the remarkable students' performances on international assessments of student performance. This finding can be attributed to many factors, such as clear education goals, parental and society engagement, as well as alignment of policies, practices, and preparation (Lee & Low, 2017). According to Heckman (2012), "the brain develops rapidly to build the foundation of character and cognitive skills necessary for success in school, health, career, and

life". Heckman's statement points to the fact that investment in the early education sector should not be left out because early years care leads to better life outcomes (Currie, 2018). In recent years, Singapore's government has placed heavy investment in early childhood care and education. The system is divided into three levels (Karuppiah, 2022):

(i) infant and toddler care for children aged between two months and three years old,

(ii) nursery for three and four-year-olds, and

(iii) kindergarten for five and six years old.

While some parents may enrol their children in child care centres (for half- or full-day), others may enrol in kindergartens if they have caregivers to assist with caring of their children either before or after kindergarten hours. Although early childhood education in Singapore is not compulsory, about 99% of children attend at least one year of preschool before entering Primary One (Tan, 2017).

"In the past, kindergartens were regulated under the Education Act 1958 and childcare centres were regulated under the Childcare Act 1988" (Karuppiah, 2022, p. 45). Until 2013, kindergartens and child care centres were regulated under the purview of two ministries. The Ministry of Education (MOE) oversaw the operations of kindergartens, while the Ministry of Social and Family Development (MSF) oversaw the operations of child care centres (Khoo, 2010). In 2013, MOE and MSF set up the Early Childhood Development Agency (ECDA) to consolidate the government's efforts for planning and implementing changes in the preschool sector (Karuppiah, 2022). The introduction of the Early Childhood and Development Centres Act 2017 further strengthens ECDA's work at the preschool sector (Karuppiah, 2022).

In 2003, the MOE launched the *Nurturing Early Learners: A Framework for a Kindergarten Curriculum in Singapore* (KCF) with the major objective to provide all children, regardless of age groups and financial background, a similar quality of learning (Tan, 2007). Using the KCF framework, many preschools have focused on preparing children for primary school rather than lifelong learning and development of socioemotional competencies. In 2008, the KCF was revised to meet the changing needs of early childhood education, primarily for nursery and kindergarten programmes. Ensuring that the nurseries and kindergartens in Singapore provides quality education to children, in 2013, the MOE revised the KCF framework and called it as the *Nurturing Early Learners: A Curriculum Framework for Kindergartens in*

Singapore (NEL 2013) (Karuppiah, 2022). The NEL 2013 is a guiding framework for nurseries and kindergartens to adopt and use when providing learning experiences for children between 4 and 6 years old. The aim is to provide a balance of knowledge, skills, and dispositions to nurture children's thinking, creativity, curiosity, and sense of wonder (Karuppiah, 2022). In 2022, the NEL 2013 was updated to *Nurturing Early Learners: A Curriculum Framework for Preschool Education in Singapore* (NEL 2022) (Ministry of Education, 2022a). The NEL 2022 places more emphasis on values, social and emotional competencies, and learning dispositions to ensure that children can better adapt in the constantly changing environment.

In 2011, the MSF launched the *Early Years Development Framework* (EYDF) (Early Childhood Development Agency, 2013), which is used as a guiding framework in child care centres for children between 2 and 36 months old. The EDYF emphasises that infants and toddlers need both care and education. In 2023, the EYDF was updated to provide more prominence in four areas of development – cognitive, communication and language, physical, and social and emotional (Early Childhood Development Agency, 2023). Five principles were outlined using the acronym of C.H.I.L.D to provide teachers with guidelines on the implementation of meaningful experiences and engagement with children in child care centres.

3   Brief History of Works by Piaget, Vygotsky, and Feuerstein

3.1   Piaget's concepts on the cognitive development of children

Jean Piaget is a Swiss psychologist whose work (1959) addresses the internal world of individuals with respect to intelligence and raises questions pertaining to the structure of the mind. According to Piaget, logical thinking and reasoning regarding complex situations symbolise the highest form of cognitive development. In his model of cognitive development, Piaget proposes that there are psychological structures in individuals' minds that account for their behaviours. These structures are universal across settings and tasks and stand on their own. In the review of Piaget's work, Chapman (1988) notes that Piaget's proposal was based on three interrelated conceptions:

   (i) the relation between action and thought,

   (ii) the construction of cognitive structure, and

(iii)the role of self-regulation.

This means that the relationship between social practices, cultural environment, and an individual's relations to other individuals is not connected. According to Piaget (1959), these thought processes develop sequentially. He divided cognitive development into four key stages: sensorimotor, pre-operations, concrete operations, and formal operations.

Preschool children, as early as three years old, are usually approaching the concrete operational thinking stage. The major areas of cognitive development within this stage include class inclusion, relations (including seriation, space, time, and causality), conservation, and number concepts. Thus, Piaget's investigation centered around children's manipulation of and interaction with his/her environment. However, he gave little consideration in his theory to the great differences among individuals in the developmental processes that are considered universal outcomes of both environment and surroundings.

3.2   Vygotsky's social context of cognitive acquisition within the zone of proximal development

Lev Vygotsky is a Russian psychologist who believed that the social environment plays an important role in cognitive development. His theory was developed in the 1920s, but it was only in the 1980s that it gained popularity. According to Vygotsky (1978), all psychological processes are social processes that are created through interactions with the social environment. He posited that "higher mental processes be viewed as functions of mediated activity" (cited in Kozulin & Presseisen, 1995, p. 68), which led to him suggesting three types of mediators: material tools, psychological tools, and other human beings.

Material tools have directly influenced psychological processes as they are directed at processes in nature. Psychological tools connect the external and the internal and mediate the social and the individual. They act as symbolic artifacts (e.g., signs, symbols, formulas, and graphic-symbolic devices) that mediate both human social processes and thinking. Inserted between the object and the psychological operation, they act as an intermediate link. In other words, they "serve as a bridge between individual acts of cognition and the symbolic sociocultural prerequisites of these acts" (Kozulin, 1998, p. 1). Vygotsky (1987) emphasised that

children's psychological functions appear twice, first at the social level and second at the individual level. This means that the first level is inter-psychological (child and people), and the second level is intra-psychological (inside the child).

Based on the idea of mediated learning, Vygotsky significantly contributed to the understanding of intelligence based on the theory of internalisation, the theory of convergence of speech and practical activity, and the zone of proximal development. He (Vygotsky, 1978, p. 86) defined the zone of proximal development as "the distance between the actual developmental level as determined by individual problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers." In his view, logical memory, categorical perception, voluntary attention, and self-regulation of behaviour are representations of the highest forms of psychological functioning. Despite this thinking, Vygotsky did not attempt to elaborate on the activities of human mediators beyond their function. As Kozulin (1994, p. 284) states, "the role of the human mediator is not fully elaborated within [Vygotsky's] theoretical framework." This incomplete elaboration left a gap in Vygotsky's theory of mediated activity.

3.3   Feuerstein's theories of Structural Cognitive Modifiability and Mediated Learning Experience

Reuven Feuerstein built on Vygotsky's idea that social interactions play a crucial role in cognitive development and place a strong emphasis on the importance of the human being as the mediator. According to Feuerstein et al. (1980, p. 385), "cognitive factors can be considered key elements to the individual's successful adaptation, particularly in a technological and rapidly changing society." This means that adequate attention should be provided not only to learners' ability to think but also to what is happening in their minds in terms of their cognitive processes.

The key ingredient of Feuerstein's (1990) Theory of Structural Cognitive Modifiability (SCM) is the modifiability of cognition. He argued that an individual's capacity to learn is not solely determined by one's genetic endowment. Instead, he suggested that it can be enhanced through mediation. The SCM theory suggests that a child with cognitive deficiencies has every opportunity for modification and positive development. The concept of modifiability in SCM

does not refer to merely remediation of specific behaviours, but also to changes of a "structural nature" (i.e., internal changes in cognition rather than external changes in behaviour). Such cognitive modifications are durable, substantial, and meaningful to the individual. They should also impact on the individual holistically as well as his/her dispositional traits, thinking ability, and general level of competence. Past studies, such as Lebeer (2016), have demonstrated cases of young adults with acquired brain damage being successful in improving their cognition through cognitive rehabilitation programme using Feuerstein's SCM theory.

How do we bring about a structural modification of cognition? The question relates to the basis of effective intervention or interaction. Embedded in SCM is the Theory of Mediated Learning (MLE) (Feuerstein et al., 2006), which Feuerstein et al. (1979, p. 110) defines as the "human interactions that generate the capacity of individuals to change, to modify themselves in the direction of greater adaptability and toward the use of higher mental processes". The human mediator may be a parent, teacher, facilitator, or some significant other who plays the intentional role of explaining, emphasising, or interpreting so that the child builds up a meaningful model of the context during the process. The mediator may also use different strategies, such as focusing, alerting attention, changing stimulus frequency and order, and relating new information to familiar contexts, to obtain the child's attention, curiosity, and vigilance and provide meaning to neutral stimuli. From a cognitive perspective, sufficient mediation facilitates the development of the child's cognitive function. The child gradually adopts the process and becomes integrated to the mechanisms of change. As the child develops self-mediation strategies, the mediator gradually withdraws from the situation to provide the child with more autonomy in executing the acquired mediated strategies. Hence, the focus on MLE lies on the importance of mediated learning and the adverse consequences of its absence, reduction, and poor quality. Three parameters are considered as basic 'ingredients', which mean that they are necessary and sufficient for MLE interactions to take place. They are also regarded as universal and applicable to any context. The other nine parameters are considered as situational and need not always be present because they are related to culture and task dependent.

3.3.1 Intentionality and Reciprocity (IR)

Feuerstein et al. (1979, p. 71) conceptualise "intentionality" as an "experienced, intentioned adult who … [interposes] himself between the child and external sources of stimulation." Jensen & Feuerstein (1987) clarify that the mediator interacts with the child in a meaningful way and that interaction is "clearly not accidental; it is a conscious intentioned act … [which] is a dynamic process in which the mediator … attempts a series of actions to reach the objective of mediation" (Klein & Feuerstein, 1985). In other words, the content of the interaction is deliberately shaped by the intention of the mediator to mediate the stimuli, activity, or relationship with the child.

"Reciprocity" is closely connected with "intentionality", suggesting that it is impossible to conduct an interaction without some shared interest and investment. However, the challenge is to elicit reciprocity from the child because some children may demonstrate poor reciprocity due to their physical condition, such as autism and sensory impairment. Feuerstein et al. (1980, p. 22) explain that "intentionality is not only a characteristic of the mediator, but is also shared by the recipient of mediation as part of the interactive process." This means that IR need not be clearly articulated but can be deduced from the behaviours. Jensen and Feuerstein (1987) clarify that IR works together to ensure the existence of the bond between the mediator and the child.

For example, the mediator informs the child, "I want you to listen to this recording carefully. Therefore, I increase the volume." When such interaction takes place, the intention is explicitly and purposefully transforming the three partners involved – the stimuli, the mediator, and the child – ensuring the child experiences it. The amplitude, tonality, and saliency of the stimulus are modified accordingly to ensure it is well observed and perceived. In addition, the rhythm of appearance of the stimuli, its frequency, and the redundancy of exposure to the interaction are altered by the mediator to intentionally make it part of the behavioural repertoire. Such transformation of the stimuli is accompanied by the mediator's efforts to transform the child's mental, emotional, and motivational state. Therefore, the stimuli help to create a conscious and aware condition that can affect the child's mental process and peripheral sensory-motor systems. In simpler terms, IR highlights that the interaction taking place between the mediator and the child is content-specific and has clear goals from the mediator to help transform the mental state of the child and subsequently change the child's behaviour. The desired outcome is to lead to developing higher mental processes, which gravitate to more efficient learning.

3.3.2 Mediation of meaning

IR responds to questions related to who, what, where, when, how, etc., while mediation of meaning deals with questions regarding why and what for, as well as questions related to the relationship for something to happen or when done. This is done by the mediator seeking to establish the propensity to gather data through systematic investments, elaborate and transform stimuli, and impose the necessary expectancies (Jensen & Feuerstein, 1987). To reduce impulsivity and increase the child's attention, Feuerstein et al. (1980, p. 27) explain that "certain stimuli are selected by the mother as being more relevant and meaningful than others." In other words, the mediator makes the child aware of the meaning of the interaction by pointing to its importance and value.

The pedagogical reasoning of the mother is usually kept secret from the child. The belief held by the mediator is that when the child encounters with the stimuli, changes occur autonomously. The child discovers what suits him best to stay compatible with his "innate" characteristics. Irrespective of the communication modality used, mediation of meaning is strongly determined by individual's cultural roots and heritage. In other words, it is a reflection of attitudes and values that shape the child's behaviour. There are two major roles played by the mediation of meaning in determining the quality of the interaction and its power. The first is the representation of efficiency, which the mediator attempts to convey to the child. The way to mediate the meaning may differ from culture to culture and vary with age and individual preferences, but the dynamic power of the meaning ensures that the goal is achieved. The second role is the endowment of the child to focus on the meaning in a wider sense. The transcending quality of the mediation is of the highest value in search for meaning and significance and bears the importance of modifiability of the cognitive structure of the individual and widening his need system.

3.3.3 Transcendence

Feuerstein et al. (1979) state that transcendence is associated with intentionality. Transcendence is primarily involved in moving the child from the concrete and visible to the abstract and representational. Feuerstein et al. (1979, p. 26) explain, "there is nothing in our biological

existence that necessitates abstract thinking … such processes arise in response in cultural needs … therefore, MLE is directly responsible for the functioning that transcends the biological needs of the individual."

The primary goal of an interaction between mother and child is always to ensure the child acquires the basic skills. Moving further, the goal to make the individual competent transcends the immediate goal or skill acquisition. In the mediation of transcendence, the mediator moves beyond the primary goal while changing and widening it to include more remote and important goals. The intention to transcend does not only depend on the explicit awareness of the individual. A poorly educated mother is able to transcend the immediate goal of her interaction with her child by forming an operational expression and using techniques from her culture for transmission to her child that ensure the efforts continue. Although the level of awareness differs with each individual, it does not affect the efficiency and outcome of the mediational process. Instead, the transcending process involves increased growing areas of cognition and emotions as well as development of human characteristics on both phylogenetic and ontogenetic levels.

As the process occurs at the very beginning of the MLE, it should not be considered as an attribution of the situation. The awareness, consciousness, and intentionality related to the transcendence process are collectively represented and as such, determine the modes of the individual's behaviour that is transmitted through interaction. When cultural content is involved, irrespective of the level of technological content of functioning and the richness of language used in the interaction, the goal of transcendence is to change all three partners involved – the stimuli, the mediator, and the child.

4   Application of MLE in Early Childhood

Children are born with curiosity and have a desire to seek novelty. They are free to explore and make errors. Their interaction with language, cultural tools, artifacts, and social environment leads to the development of new functional systems in their brain. During those interactions, parents are responsible for ensuring that their children have a meaningful and enjoyable learning experience. Additionally, the children's emotional and social aspects are important in the development of their well-being. According to Chan and Yang (2024, p. 106), children's well-

being is "holistic, complex, multidimensional, and interconnected" because it involves physical, cognitive, socioemotional, and sociocultural domains that are intimately linked to home and school settings. The Organisation for Economic Cooperation and Development (Organisation for Economic Cooperation and Development, 2021, p. 11) emphasises that children's well-being is critical because it shapes children for "who they are, how they behave, and what they do when they grow up". In other words, 'who the children will grow up to be like' and 'how our future society will be shaped as' are heavily influenced by the well-being of children.

There are many definitions of the concept of well-being. However, for the discussion of this article, we support the definition provided by the World Health Organisation (World Health Organisation and the United Nations Children's Fund, 2021, p. viii), that is, well-being as "having the support, confidence, and resources to thrive in contexts of secure, healthy relationships, and realise one's full potential and rights". The definition aligns with our discussion because parents and teachers play crucial supporting roles in providing children with holistic learning experiences while at the same time building relationships with peers and those around, whether in home or school settings. As children's physical, cognitive, socioemotional, and sociocultural development is a complex process, the MLE strategies are applicable in "help[ing] children internalise learning mechanisms, facilitate learning process and self-mediation, give indications about future changes of cognitive structures, develop deficient cognitive functions, and provide for the ability to benefit in the future from mediation in other context" (Tzuriel & Caspi, 2017, p. 303). In the world of Feuerstein et al. (1980, p.16), "the more and the earlier an organism is subjected to MLE, the greater will be his/her capacity to efficiently use and be affected by direct exposure to sources of stimuli."

Research on MLE has pointed to the fact that when parents assume the role of facilitators, children become better learners because MLE encourages meaningfulness, competency, and goal-seeking interactions. Tan (2002) argues that adaptability and creativity are not necessarily captured in content knowledge and measured by examination scores. Instead, there is a need for the change of mindsets of both the present and future generations in learning how to learn. There is also the need for continuous learning and embracing new approaches to learning in order to prepare individuals with relevant competencies. The use of MLE can, therefore, help parents to reexamine their roles as:

(i) facilitators for helping children to exercise positive habits,

(ii) facilitators for teaching children the proper rituals,

(iii)mediators of lifelong and life-wide learning, and

(iv)designers of the learning environment.

Studies such as Klein and Aloni (1993), Tzuriel (1996), and Tzuriel and Weiss (1998), have applied MLE to infants, preschool children, and school children. They found that the MLE approach could be catered to children with different learning styles and needs because it emphasised on the mediator's communication of principles and strategies to children to adapt to new situations (Feuerstein et al., 2002). In a similar application, we reconceptualise the three essential parameters as 3Ps (see Figure 1):

(i) Intentionality and reciprocity = presence,

(ii) Mediation of meaning = purpose, and

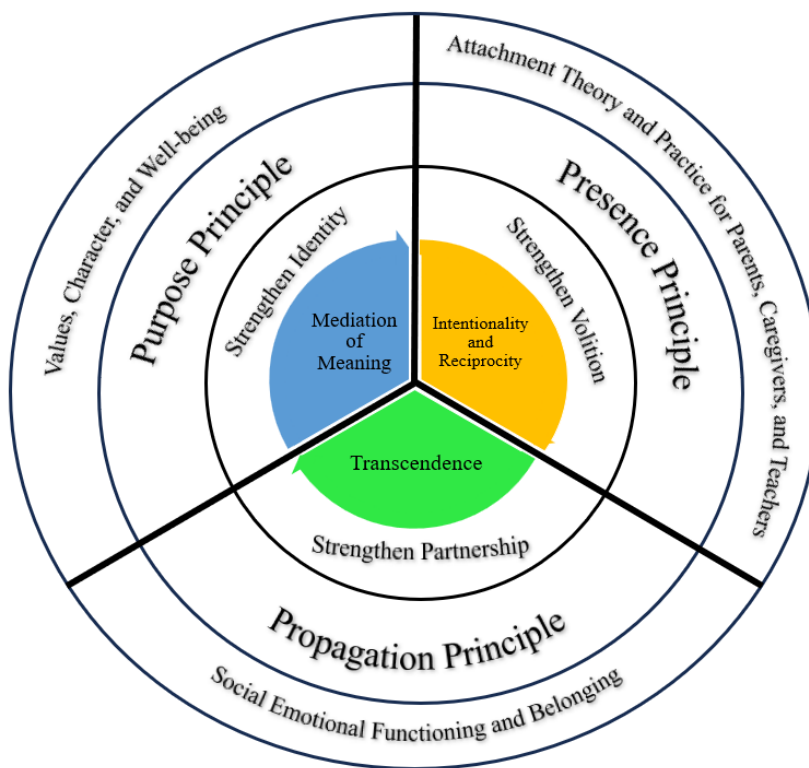(iii) Transcendence = propagation.

Figure 1: Re-conceptualisation of 3P parameters for the application in early childhood education

In the following sections, we provide explanation regarding each parameter through examples at home and in preschools/child care centres in Singapore. Note that the terms *caregivers* and *parents* may be used interchangeably but denote similar meaning.

4.1 Presence

For the first P, presence, we explore the existence of mediators (parents and teachers) in providing care for children's lives. Scholars such as Mikulincer et al. (2003), Moss and St-Laurent (2001), and West et al. (2013) have researched the concept of attachment in early years as a predictor of children's cognitive development. Their findings show that parents' activities play a role in influencing children's cognitive and intellectual development (Tzuriel, 1999, 2001, 2013). Such is also evidenced in studies conducted in the US (Loughlin-Presnal & Bierman, 2017) and China (Luo & Gao, 2022), which suggest that parental beliefs and involvement is important for children's academic achievement starting from the early years. In other words, parents' presence as the first adult figures in providing care and attention to children is crucial.

In Singapore's fast-growing economic landscape, most parents are working full-time and therefore, they send their children to child care centres from a very young age (Ministry of Community Development Youth and Sports, 2008). This means that children spend less time at home on weekdays. Nevertheless, parents can design a home routine that is programmatic to ensure children exercise positive habits. In fact, the EYDF (Early Childhood Development Agency, 2013, p. 51) states that "parents are the key significant people in children's lives" and "have valuable insights into their children's temperaments and dispositions". Therefore, the EYDF suggests that a strong home-centre partnership is vital in providing children with quality and consistent care, development, and education. In addition, it recommends a stable and secure environment to support children's transition between home and centre, which is necessary for their socioemotional development and well-being.

In order for such a home routine to take place, parents need to have clear intentions and aims of what they seek to teach their children. Parents need to plan the ideal for a warm and inviting learning environment and provide a range of materials and psychological tools to

support their children's learning and growing experiences. These are usually supported through the government's subsidy for housing (e.g., Enhanced Central Provident Fund Housing Grant (Housing Development Board, 2023)) and child care services (e.g., Kindergarten Fee Assistance Scheme (Early Childhood Development Agency, 2022), Baby Bonus Cash Gift (Made For Families, 2023), Child Development Account (Ministry of Social and Family Development, 2023)) including free public library membership for Singaporeans and Permanent Residents (one-time off registration fee) (National Library Board, 2023). Teachers can also offer ideas to parents to support the children in their learning through parent-teacher committees, focus group discussions, informal feedback, and informative leaflets/articles. Through this support, parents and teachers are able to build mutual respect and trust to bridge the barriers and foster an understanding for the benefits of children.

The attachment provided by parents to their children is significant as it encourages socioemotional reciprocity in interactions and co-regulation of interest and emotions. When parents spend time with their children and engage in activities such as reading, drawing, exercising, playing games, and gardening, they form the parent-children bonding, which supports children's development of socioemotional, language, numeracy, and communication skills. In other words, the bonding and emotional connection developed between parents and children helps to establish a habit that is not only significant for the children's academic success but also the development of their social and mental health. When the parents and children spend too much time separately with electronic gadgets such as smartphones and tablets, the children ultimately feel disconnected from their parents and the world, leading to the development of anxiety and withdrawal. Consequently, criminal behaviour develops in the children when they grow up as adults. Depression and other mental issues may also occur within the children. Therefore, parents need to organise a routine that is programmatic to ensure their children exercise positive habits from an early age.

A similar routine should also take place at preschools and child care centres. According to the NEL 2022, teachers play an important role in stimulating and deepening children's learning based on their ability, knowledge, and skills (Ministry of Education, 2022a). There are six *iTeach* principles that guide teachers in planning, designing, and implementing appropriate

and meaningful learning experiences for children. The *iTeach* principles (Ministry of Education, 2022a, p. 62) consist of:

(i) an integrated approach to teaching and learning,

(ii) teachers as facilitators of learning,

(iii) engaging children in learning through purposeful play,

(iv) authentic learning through quality interactions,

(v) children as constructors of knowledge, and

(vi) holistic development.

Putting the iTeach principles into practice, the NEL (Ministry of Education, 2022a, p. 79) recommends that teachers need to play the roles of:

(i) thoughtful planners,

(ii) responsive facilitators,

(iii) reflective practitioners, and

(iv) collaborative partners.

As thoughtful planners, teachers are guided by their beliefs about who children are, what they are capable of doing and learning, and how they learn. As responsive facilitators, they stimulate children's thinking and expand their learning, while as reflective practitioners, they constantly engage in reflective practice and equip themselves with the necessary knowledge and skills to design good quality learning experiences for children. Lastly, as collaborative partners, they create strong partnerships with families and the community in ensuring children receive a good start in life. Hence, in the contexts of preschools and child care centres, the presence of teachers as designers of the learning environment is crucial in forming interactive engagement with students and fostering independence and a higher level of interdependence (e.g., sharing and networking). Due to such importance, teachers need to communicate their intention explicitly to children and ensure they receive responses from them. These efforts will result in teachers playing an effective coaching role and children developing higher-order thinking skills.

4.2 Purpose

For the second P, purpose, we examine the purpose of mediation in children's lives. The mediation that takes place between parents and children needs to create a meaning from the early beginning of their interaction. Parents usually communicate with their children verbally (e.g., illuminating an event or activity, relating it to current or past events, and explaining its value) and nonverbally (e.g., facial expression, tone of voice, rituals, and repetitious actions). These kinesthetics and various communication modalities act as a reflection of parents' intention to ensure their children understand the message. As communication continues to take place, parents interact with their children using more words that designate meaning and significance. Further development and more complex verbal modalities may be used in the mediation process to create further meaning while the children search for the respective meaning.

In many families, parents and grandparents are natural mediators because the goal they pursue with different degrees of consciousness is to transmit the family and cultural values and life goals to their children and grandchildren, ensuring the continuation of those values. In Singapore's multiracial society, three main ethnic communities (Chinese, Malays, and Indians) live together while practising different rituals and traditions (Singapore Tourism Board, 2023). Though they differ, the ultimate message of being respectful, appreciative, helpful, responsible, and resilient is similar when educating children. In 2016, Ng Chee Meng, Singapore's past Minister of Education, emphasised that "being self-reliant and having the resilience to bounce back after setbacks will be increasingly important" (Ng, 2016). Ng's words are translated into one of Singapore's present-day education modules – Character and Citizenship Education (CCE) (Ministry of Education, 2022b). The main focus of CCE lies on nurturing self-directed and lifelong learners who possess 21st-century competent skills reinforced by core values such as resilience and perseverance so that they will grow up with confidence and become active and contributing citizens. These competencies train children to confront challenges and adapt to changes when necessary. As cultivating future-ready and resilient children is crucial, interactions between parents/grandparents and children need to be purposeful and establish clear meaning. When there is a lack of meaning during the interaction, it may affect both parents/grandparents and children, resulting in a lack of emotional-affective relationship. Additionally, it may cause disadvantages in other aspects, including cognitive, which affects the children's motivation and

goals in life. In the worst case, the children may give up due to them experiencing a life without meaning and are unmotivated.

In child care centres, teachers need to interact purposefully with children so that children will have a clear understanding of happenings and future activities. This is because the transition from home to child care centre may not be a pleasant experience for many toddlers and infants because they may feel anxious and have a fear of being abandoned. The degree of anxiety varies among them; hence, it is vital for teachers to gradually introduce them to different stages of play while allowing them to familiarise themselves to the respective teachers and environment and gain trust and confidence. This will also help parents to understand the process of transition and prepare themselves as well as toddlers and infants for the transition. The same process applies when these young children progress from a child care centre to preschool. In preschools, there are more activities where teachers perform together with children. For example, the teacher plans to decorate the classroom board for a festival. She informs the children of the purpose of the activity. Subsequently, she talks about the process of designing the board and preparing the materials. She teaches the children to create some artwork with the prepared materials. Lastly, she displays the children's artwork on the board, leading to the accomplishment of the activity. During the breaking down process from a big chunk to small parts, children learn the purpose of the activity, which enables both the teacher's and children's goals to be achieved. As the EYDF (2013, p. 19) states, "young children thrive on interactions that are respectful, responsive, and reciprocal with nurturing adults. When carried out in a consistent, reliable, and predictable manner, these interactions create warm and nurturing experiences for young children".

4.3   Propagation

In the third and final P, propagation, we explore the belief system that is incorporated by caregivers into children's lives. Caregivers need to widen the goals of interactions, particularly those related to academics, held between themselves and children. When such a situation takes place, it creates a propensity to enlarge the adult's cognitive and affective repertoire of functioning constantly. Once the children are aware of the basic goals, they shall benefit from them and be able to pursue and understand the more developed goals that go beyond academic achievements.

In 2022, Singapore's Deputy Prime Minister (present-day Prime Minister), Lawrence Wong, emphasised the importance of adopting a mindset of lifelong learning when speaking at the CNA Youth Forum (Tan, 2022). As many students find Singapore's education system overly rigorous, Wong stated it is currently shifting towards more holistic learning while providing students with time and space to explore other things beyond the school curriculum. For example, the Ministry of Education has introduced changes to school-based assessments, such as removing certain academic indicators (student ranking) and abolishing mid-year examinations across all levels (Ministry of Education, 2018). Such changes allow students to realise their full potential based on their strengths to achieve success without having the sense to compare themselves with others while engaging in experiences related to real-world application of knowledge. Additionally, the changes help students to celebrate excellence and reduce stress and anxiety. Wong's statement is reinforced by Singapore's Minister of Education, Chan Chun Sing, who recently urged Singaporeans to move beyond classroom grades toward a meritocracy of skills, which provides a pathway for lifelong learning (Teng, March 2023).

In Singapore's current early childhood education curriculum, the focus does not lie solely on academics but provides a holistic learning experience for children. It benefits the well-being of children and helps to reduce their anxiety and fear of not performing well academically. According to the EYDF (Early Childhood Development Agency, 2023), toddlers and infants at childcare centres are provided with caregiving routines, play, and other experiences that offer opportunities for physical, cognitive, and socioemotional development, including early numeracy and problem-solving, as well as communication and language development. These holistic learning experiences allow them to foster creativity, promote self-confidence and esteem, and develop their motor skills and eye-hand coordination. As they progress to preschools, the NEL 2022 continues to offer quality preschool education to help them to be equipped "with the values, dispositions, knowledge and skills that are needed for them to be future-ready and to relate well with the world around them" (Ministry of Education, 2022a, p. 11). Its key areas of learning are divided into five areas:

(i) aesthetics and creative expression,
(ii) discovery of the world,
(iii) health, safety, and motor skills development,

(iv) language and literacy (English and mother language languages), and

(v) numeracy.

These five key learning areas serve to guide teachers in planning appropriate curricula and creating meaningful learning experiences for children to support their holistic development. They also reflect what children should know and be able to do upon completion of their preschools. Depending on their level of developmental needs, they will continue to work towards their individual goals as they enter primary and secondary schools.

To align with the holistic learning experiences at preschools and child care centres, caregivers need to have realistic expectations of children during the learning process, a process in which the expectation should be balanced between success and failure. If the expectation is too high, children may end up being overwhelmed and stressed because their focus is diverted towards classroom grades only. In the long run, the overly high expectation will affect their socioemotional well-being. Caregivers need to keep in mind that children's well-being is complex, all-inclusive, multi-dimensional, and interrelated because they involve numerous domains that have bi-directional connections with home and school contexts. To avoid such a situation, caregivers need to be cautious during interactions to deliver a holistic well-being experience for children so that they are able to develop positive emotions. These efforts will lead to both caregivers and children achieving widened goals of interactions.

5   Way Forward

In today's world, both mediators (parents, grandparents, caregivers, and teachers) and children are heavily engaged with the World Wide Web (www), particularly with the widespread uses of digital technology. The main concerns of such pervasive usage are cybersecurity and data privacy. Additionally, although the popular use of artificial intelligence (AI) helps to improve performances, overusing it may lead to the loss of creativity. Hence, the role of mediators is crucial in mediating and connecting children to the appropriate knowledge and purposes of life, starting from a young age. Nevertheless, the biggest challenge for the mediators is to design a contemporary learning environment that suits today's rapid digital transformation while at the same time equipping children with learning, thinking, and problem-solving skills as well as

engaging in virtues of being human. When navigating cyberspace, children need to be equipped with knowledge of cyber wellness so that they become responsible users of information and communication technologies. Therefore, the re-conceptualisation of 3Ps in MLE, as seen in Figure 1, is applicable in drawing out a pathway for parents, caregivers, and teachers to reflect on their facilitating and mediating roles as well as planning and building a futuristic learning environment that is suitable for the upbringing of children. Using the 3P parameters, development mediation programmes can also be implemented for those children with learning and behavioural difficulties or parents/caregivers/teachers who, for various reasons, lack mediation skills and experiences.

References

Chan, R. K. C., & Yang, Y. (2024). The role of caregivers in promoting children's well-being in early childhood. In O. S. Tan, E. L. Low, I. S. Caleon & E. L. Ng (Eds.), *Enhancing holistic well-being of children and youth: Insights from Singapore into research, policy and practice in education* (pp. 105-119). Springer.

Chapman, M. (1988). *Constructive evolution: Origins and development of Piaget's thoughts.* Cambridge University Press.

Currie, J. (Writer). (2018). *Life, death, and mental health: How access to care helps children succeed* [Video]. Institute of Fiscal Studies.

Early Childhood Development Agency. (2013). *Early years development framework for child care centres.* https://www.ecda.gov.sg/docs/default-source/default-document-library/early-childhood-educator/eydf-eng.pdf

Early Childhood Development Agency. (2022). *Child care infant care subsidy.* https://www.ecda.gov.sg/parents/subsidies-financial-assistance

Early Childhood Development Agency (2023). *Early Years Development Framework (EYDF).* https://www.ecda.gov.sg/early-childhood-educators-(ece)/curriculum-frameworks/early-years-development-framework

Feuerstein, R. (1990). The theory of structural modifiability. In B. Presseisen (Ed.), *Learning and thinking styles: Classroom interaction* (pp. 68-134). National Education Association.

Feuerstein, R., Feuerstein, R. S., & Falik, L. H. (2010). *Beyond smarter: Mediated learning and the brain's capacity for change.* Teachers College Press.

Feuerstein, R., Feuerstein, R. S., Falik, L. H., & Rand, Y. (2006). *Creating and enhancing cognitive modifiability: The Feuerstein instrumental enrichment program.* ICELP Publications.

Feuerstein, R., Rand, Y., & Hoffmann, M. B. (1979). *The dynamic assessment of retarded performers: The learning potential assessment device, theory, instruments, and techniques.* University Park Press.

Feuerstein, R., Rand, Y. Hoffman, M. B., & Miller, R. (1980). *Instrumental enrichment: An intervention program for cognitive modifiability.* University Park Press.

Heckman, J. J. (2012). *Invest in early childhood development: Reduce deficits, strengthen the economy.* https://heckmanequation.org/resource/invest-in-early-childhood-development-reduce-deficits-strengthen-the-economy/

Housing Development Board. (2023). *Enhanced CPF housing grant (families).* https://www.hdb.gov.sg/residential/buying-a-flat/understanding-your-eligibility-and-housing-loan-options/flat-and-grant-eligibility/couples-and-families/enhanced-cpf-housing-grant-families

Jensen, M. R., & Feuerstein, R. (1987). Dynamic assessment of retarded performers with the Learning Potential Assessment Device: From philosophy to practice. In C. S. Lidz (Ed.), *Dynamic assessment: An interactional approach to evaluating learning potential* (pp. 379-402). Guildford Press.

Karuppiah, N. (2022). Pre-school teacher education in Singapore: Developments and challenges. In O. S. Tan, K. K. Poon, B. A. O'Brien & A. Rifkin-Graboi (Eds.), *Early childhood development and education in Singapore* (pp. 43-60). Springer.

Khoo, K. C. (2010). The shaping of childcare and preschool education in Singapore: From separatism to collaboration. *International Journal of Child Care and Education Policy, 4*(1), 23-34. https://doi.org/10.1007/2288-6729-4-1-23

Klein, P. S., & Aloni, S. (1993). Immediate and sustained effects of maternal mediation behaviours on young children. *Journal of Early Intervention, 17*(2), 1-17. https://doi.org/10.1177/105381519301700

Klein, P. S., & Feuerstein, R. (1985). Environmental variables and cognitive development: Identification of the potent factors in adult-child interaction. In S. Harel & N. J. Anostasiouw (Eds.), *At risk infant: Psycho/socio/medical aspects* (pp. 369-377). Paul H. Brooks.

Kozulin, A. (1994). Cognitive revolution in learning: Piaget and Vygotsky. In J. N. Mangieri & C. C. Block (Eds.), *Creating powerful thinking in teachers and students: Diverse perspectives* (pp. 269-287). Harcourt Brace.

Kozulin, A. (1998). *Psychological tools: A sociocultural approach to education.* Harvard University Press.

Kozulin, A., & Presseisen, B. (1995). Mediated learning experience and psychological tools. *Educational Psychologist, 30*(2), 67-76. https://doi.org/10.1207/s15326985ep3002_3

Lee, S. K., & Low, E. L. (2017). *Singapore's education system: Some key success factors.* https://www.nzcpr.com/singapores-education-system-some-key-success-factors/

Leeber, J. (2016). Significance of the Feuerstein approach in neurocognitive rehabilitation. *NeuroRehabilitation, 39*(1), 19-35. https://doi.org/10.3233/NRE-161335

Made For Families. (2023). *Baby bonus scheme.* https://www.madeforfamilies.gov.sg/support-measures/raising-your-child/financial-support/baby-bonus-scheme

Mikulincer, M., Shaver, P. R., & Pereg, D. (2003). Attachment theory and affect regulation: The dynamics, development, and cognitive consequences of attachment related strategies. *Motivation and Emotion, 27,* 77-102. https://doi.org/10.1023/A:1024515519160

Moss, E., & St-Laurent, D. (2001). Attachment at school age and academic performance. *Developmental Psychology, 37,* 863-874. https://doi.org/10.1037/0012-1649.37.6.863

Ministry of Community Development Youth and Sports. (2008). *Child care in Singapore: Waves of professionalism*: C*elebrating 10 years of child care seminars, 1999-2008.*

Ministry of Education. (2018a, September 28). *'Learn for life' – Preparing our students to excel beyond exam results.* https://www.moe.gov.sg/news/press-releases/20180928-learn-for-life-preparing-our-students-to-excel-beyond-exam-results

Ministry of Education. (2022a). *Nurturing Early Learners: A Curriculum Framework for Preschool Education in Singapore (NEL 2022).* https://www.nel.moe.edu.sg/resources/frameworks-and-guidelines

Ministry of Education. (2022b). *21st century competencies*. https://www.moe.gov.sg/education-in-sg/21st-century-competencies

Ministry of Social and Family Development. (2023). *Child development co-savings (baby bonus) scheme.* https://www.babybonus.msf.gov.sg/Pages/aboutus.aspx

National Library Board. (2023). *Types of membership.* https://www.nlb.gov.sg/main/services/library-membership/types-of-membership

Ng, C. M. (2016). *Speech by Mr Ng Chee Meng, Minister for Education (Schools), at the 19th appointment and appreciation ceremony for principals.* https://www.moe.gov.sg/news/speeches/20161229-speech-by-mr-ng-chee-meng-minister-for-education-schools-at-the-19th-appointment-and-appreciation-ceremony-for-principals

Organisation for Economic Cooperation and Development. (2021). *Measuring what matters for child well-being and policies.* OECD Publishing. https://doi.org/10.1787/e82fded1-en

Piaget, J. (1959). *The language and thought of the child.* Routledge & Kegan Paul.

Singapore Tourism Board. (2023). *Faces of Singapore.* https://www.visitsingapore.com/travel-guide-tips/about-singapore/people-of-singapore/

Tan, A. (2022, December 2). DPM Wong urges youths to take action to build a better Singapore. *Youthopia.* https://youthopia.sg/read/dpm-wong-urges-youths-to-take-action-to-build-a-better-singapore/

Tan, C. T. (2007). Policy developments in pre-school education in Singapore: A focus of the key reforms of kindergarten education. *International Journal of Child Care and Education Policy, 35*(1), 35-43. https://doi.org/10.1007/2288-6729-1-1-35

Tan, C. T. (2017). Enhancing the quality of kindergarten education in Singapore: Policies and strategies in the 21st century. *International Journal of Child Care and Education Policy, 11*(7). https://doi.org/10.1186/s40723-017-0033-y

Tan, O. S. (2002). Knowledge and participation reconsidered: Some implications for teaching and learning. *aCEDemia, 1,* 3-4.

Teng, A. (2023, March 11). Singapore education should move beyond focus on grades to a meritocracy of skills: Chan Chun Sing. *The Straits Times.* https://www.straitstimes.com/singapore/s-pore-education-should-move-beyond-focus-on-grades-to-a-meritocracy-of-skills-chan-chun-sing

Tzuriel, D. (1996). Mother-child mediated learning strategies in free-play and structured situations among low, medium, and high SES levels. *Child Development and Care, 126*(1), 57-82. https://doi.org/10.1080/0300443961260105

Tzuriel, D. (1999). Parent-child mediated learning transactions as determinants of cognitive modifiability: Recent research and future directions. *Genetic, Social, and General Psychology Monographs, 125,* 109-156.

Tzuriel, D. (2001). *Dynamic assessment of young children.* Kluwer Academic/Plenum Press.

Tzuriel, D. (2013). Mediated learning experience strategies and cognitive modifiability. *Journal of Cognitive Education and Psychology, 13,* 59-80. https://doi.org/10.1891/1945-8959.12.1.59

Tzuriel, D., & Caspi, R. (2017). Intervention for peer mediation and mother-child interaction: The effects on children's mediation learning strategies and cognitive modifiability. *Contemporary Educational Psychology, 49,* 302-323. https://doi.org/10.1016/j.cedpsych.2017.03.005

Tzuriel, D., & Weiss, S. (1998). The efforts of mothers' acceptance/rejection attitudes, children's personality and mothers' mediated learning strategies on cognitive modifiability. *Early Development and Parenting, 7*(2), 79-99. https://doi.org/10.1002/(SICI)1099-0917(199806)7:2<79::AID-EDP166>3.0.CO;2-%23

West, K. K., Matthews, B. L., & Kerns, K. A. (2013). Mother-child attachment and cognitive performance in middle childhood: An examination of mediating mechanisms. *Early Childhood Research Quarterly, 28,* 259-270. https://doi.org/10.1016/j.ecresq.2012.07.005

World Health Organisation and the United Nations Children's Fund. (2021). *Investing in our future: A comprehensive agenda for the health and well-being of children and adolescents.*

https://apps.who.int/iris/bitstream/handle/10665/350239/9789240037793-eng.pdf?sequence=1&isAllowed=y

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes* (M. Cole, V. John-Steiner, S. Scribner & E. Souberman, Eds. & Trans.). Cambridge University Press (Original work published 1930-33).

Vygotsky, L. S. (1987). Thinking and speech. In R.W. Rieber & A.S. Carton (Eds.), *The collected works of L. S. Vygotsky, Volume 1: Problems of general psychology* (pp. 39-285). Plenum Press (Original work published 1934).

Mediating Past the First Level of Resistance

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ABSTRACT

Resistance to new learning experiences is commonly encountered in academic and behavioral settings. and observed in the first level of resistance to new or previously avoided learning encounters. In the application of the theory of structural cognitive modifiability (SCM) and mediated learning experience (MLE), it can be systematically and effectively addressed in order to enable the learner to produce meaningful change in their thinking and learning. This paper defines the concept, discusses the application of MLE to the problem, and presents case illustrations of mediational interventions.

Introduction to the Concept of Resistance in Learned Avoidance

In this paper, we address resistance to learning demands related to task requirements and reactions to past experiences of failure, uncertainty, and disability. This resistance can occur within the context of perfectly adequate responses to life events but present areas of avoidance and self-rejection. It may or may not be accompanied by skill deficits or neurophysiological limitations. Its effects can be summarized as follows: when faced with difficult demands under conditions of performance expectation, the resistance shows itself as escaping or withdrawing from the learning experience.

For many individuals, this strategy has been successful at finding ways to escape or avoid and becomes an internalized response to the "danger" or threat of frustration. Moreover, as will be

discussed below, many adults in the life of the child (parents, teachers, etc.) are either covertly or overtly complicit in the learner's maneuvers. This has been described as learned avoidance (see Krypotos, Effting, Kindt, and Beckers, 2015).

Learned avoidance, in many instances, is reasonable and protective. In general, individuals will not do what they think they will fail at and will find ways to compensate for presumed disappointment and the potential for failure—both with regard to self-perceptions and the expectations and reactions of others. Indeed, parents and teachers, in a sincere desire to protect their children and/or students from stress and discomfort and to save themselves from tension or anticipated behavioral disruptions, are very likely to detect the early signs of avoidance and respond by releasing the child from the stress. This response can be viewed as a positive expression of caring and concern for the child, a desire to protect the child from discomfort. "Oh, I see you are tired, frustrated, hungry, anxious, thirsty, or hot, so let's stop this activity and do something else."

Learned avoidance, in many instances, is a reaction that is reasonable and protective. It represents "short-term" ways to compensate for presumed disappointment and the potential for failure. For these reasons, it is a major feature of those individuals who have experienced learning failure, adjustment difficulties, and environmental stresses.

There are many variations of this response that teachers and parents will readily recognize. However, there is a dilemma here. When, as an act of sympathy or accommodation, the learner is released from the demands of the situation, stress is reduced, and a response of avoidance is thus learned and reinforced. Yet it is also generally accepted that learning and development require a willingness to endure some degree of stress and conflict, what can be called a feeling of disequilibrium, that serves to spur engagement with the avoided tasks. Thus, accommodating to the learner's avoidance produces an *enabling* of the condition.

Resistance is not limited to the learner—both the child and adult have expectations regarding performance. Adults can project their expectations regarding performance—both in themselves and for their children and students—as part of their own personal belief systems or by past experiences. Adults may believe that the child cannot succeed or may have too much stress attempting to comply. Anger and annoyance may be mixed with disappointment. For example, the mother who says about her son: "He can't read. He never will be able to read. His father never learned to read, so why should I expect him to?"

In this way, the reciprocal nature of the reaction to resistance is revealed from the adult to the learner. The adult sees the mounting stress, anticipates the upcoming disruption of performance, and the signs of stress and conflict lead to a reaction to reduce conflict—both for the child and the adult. Going back to the example above, the mother sees that the child is having difficulties with reading. She then relates this back to his father's difficulties, thus giving the easy way out—limited expectations of her son. By doing this, equilibrium is maintained for both the child and adult. This unwittingly reinforces the child's (and the adult's) limited view of himself and the adult's limited, pessimistic, reduced expectations—all in the service of restoring or maintaining comfort levels.

The First Level of Resistance and Mediated Learning Experience (MLE)

Given the phenomenon described above, what is the reason to term this reaction a "first level of resistance?" Certainly, it is the child's initial reaction to perceived difficulty or a reminder of past failures or experiences with inadequacies. However, from the perspective of MLE (which we will describe briefly below), it can be seen as an "opportunity" to respond in a different way, leading to a different outcome. Strategically, it can be framed as a "first resistance" that does not have to be accepted as deeply embedded in the child's behavioral repertoire but is amenable to mediational interventions. This is illustrated by a young child who was assessed in a training workshop for professionals who were learning to apply MLE:

Five-year-old Enrico's grandfather brought him to an LPAD-Basic workshop to be assessed by a training team. He was described as mildly developmentally delayed and slow to learn or adjust to new situations. Indeed, during the first morning of assessment, comprising approximately three hours of activity, he was difficult to control, often expressing dislike of the activities, a short attention span, manipulative behavior, and in great need of focusing mediation and repeated efforts to keep him on task or to bring him back to task focus. The team had to work very hard and at the end of the session was frustrated and concerned that they (and he) had not had a positive experience.

At the end of the session, we spoke to his grandfather about our desire to have him return the next morning and that he might not want to come back given his difficult experience. We spoke of strategies to encourage him. When he and his grandfather returned the next morning, we asked how Enrico had been persuaded to continue to participate. "No problem," said the grandfather. That evening, as he was getting ready for bed, he inquired of his mother whether he was going back to the workshop. He said he wanted to go and that he "had fun there and learned a lot!" Moreover, his behavior was quite changed on the second day . . . he was cooperative, stayed on task, and was open to trying new and unfamiliar tasks. It was then possible to assess his cognitive functions and mediate many new skills and strategies. And then, when he asked whether he was going to come back for a third session and was told, "No, the program is finished," he expressed great disappointment. Quite a contrast to his initial reactions and quite a change in response to the mediations that were offered in that first session, many of the outcomes of which were not immediately observable by the mediators.

Imagine if they had stopped after the first encounter and formulated their assessment conclusions on the basis of it. Often, in response to an unfamiliar or challenging experience—with or without prior experiences with failure—the initial reaction is of frustration or blocking. A persistent but gentle encouragement to stay with the task, to remain in the situation, use already accomplished

skills, or be open to some assistance past the blocking will result in an overcoming of the resistance and lead to major and powerful changes in attitude, approach, and self-concept.

Enrico's initial (unmediated) response can be seen as the *first level of resistance*. The mediation he received, which he initially resisted according to his internalized reaction, is modified by the MLE interactions he experienced and enables him to be mediated beyond his first level of resistance.

The provision of MLE (Feuerstein et al, 2006), offered in a systematic and organized way, works to overcome the resistance and move the learner forward or around the resistance by capitalizing on skills and readiness and making adjustments that are not compensations for deficits but adaptations to newly acquired, strengthened, and utilized cognitive functions. For this to occur, the mediator must be familiar with the nature of the tasks that the learner is required to respond to (the Cognitive Map) and the nature of the learner's functional skills and deficiencies (the Deficient Cognitive Functions) (Feuerstein et al., 2006). These operational conceptual formulations guide and target the MLE interventions.

The Role of Expectations in the First Resistance

Both the child and the adult (mediator) have expectations regarding performance. It is important to point out that the first resistance is not limited to the learner. Adults have them as a projection of their expectations for the learner or as a part of their own personal belief systems. We may genuinely believe that the child cannot succeed or may have too much stress attempting to comply. We may or may not have anger or annoyance mixed in with our disappointment, like the mother who says of her son: "He can't read. He never will be able to read. His father never learned to read, so what should I expect of him?" Or less overtly, parents who have internalized disappointment over their child's limitations, and thus reduce expectations, accept limitations or express negative attitudes that generalize to other areas of the child's performance.

Another aspect of this part of the phenomenon is the *reciprocity* of the reaction. The parent or teacher sees the mounting stress, anticipates the upcoming disruption if the child's performance is insisted upon, and detects and reacts to the early signs by reducing conflict, both for the child and adult. By responding by reducing demands or allowing the child to stop or leave the scene of the conflict, equilibrium is maintained for both the child and adult, but the child's (and the parent's or teacher's) limited, pessimistic, low expectations and escape mechanisms are unwittingly reinforced.

The Parameters of MLE

Twelve parameters for providing MLE have been identified and described (Feuerstein et al., 2002, 2006). They are organized into three universal criteria that are present in all mediational interactions: intentionality and reciprocity (ensuring that the learner knows what will occur and arranging conditions so that they do), transcendence (conveying to the learner why the experience is occurring and where it is going), and the mediation of meaning (why it is important and what its value is both for the learner and the mediator). There are other parameters that are engaged according to specific, situational circumstances that are encountered such as the regulation and control of behavior; the mediation of feelings of competence; the mediation of sharing behavior; mediating a sense of individuation; mediating goal seeking, goal setting, and goal achieving; the mediation of challenge; the mediation of a sense of belonging; the capacity to change, and the searching for positive alternatives. These are called "parameters" because they are not specific behaviors or suggestions for action but rather general dimensions of action that guide a wide and innovative spectrum of potential mediator responses and actions.

In this way, the parameters of MLE are designed to guide the mediator's interaction with the learner to achieve modifiability through focused, persistent, and systematic activity. The ability of MLE to enable functionally disabled individuals from a wide spectrum of disabilities and to

overcome limitations in their behavioral functioning is a testament to this potential for modifiability. For this reason, the readiness on the part of the mediator to understand and engage in efforts to direct mediation toward and beyond the manifest resistance becomes absolutely critical and requires developing and moving actively toward higher expectations—both on the part of the mediatee (the learner) and the mediator (the parent, teacher, etc.).

The modifiability that is experienced creates conditions that overcome or counteract the learner's previous internalized resistance (the learned avoidance) and reduces or eliminates the need to resist. Another way of putting it is that it opens the learner to a readiness to confront that was avoided.

MLE is thus addressed and continually adjusted and modified with regard to what is being observed, both in the content (specific skills and problem-solving strategies) and the process of responding. In the latter area, the mediator observes and adjusts to the affective level of the learner (feelings and reactions), provides structure and encouragement to stay with the tasks, and provides positive feedback for already accomplished levels of performance.

Observing the First Level of Resistance

A central tenet of Feuerstein's structural cognitive modifiability theory (SCM) is that the human being is modifiable, not only at the level of behavior but also in the very mental (neurophysiological) structures of the brain. However, modifiability does not come easily or without stress.

The key to identifying and accurately observing the first level of resistance is a good knowledge of the nature of the tasks to which the learner is responding or needs to respond (an analysis of the task according to the Cognitive Map), and an equally clear understanding of the skills and

levels of functioning in the learner (using the dimensions of the Deficient Cognitive Functions) (cf. Feuerstein et al, 2006). With these perspectives and a sense of the context of the learning situations—that can vary significantly and influence learner responses—the mediator initiates activities and both observes behavioral responses and constructs interventions in a dynamically interactive way.

If, and when, the learner begins to express distress, one can assume that the first level of resistance is being approached and reasons for its appearance must be discerned. This is especially important for those learners who do not have a history of successful performance. They often do not recognize their positive achievement, they do not internalize an image or expectation of success, and they do not trust their immediate reactions. The mediation of a feeling of competence, along with support for their uniquely successful responses, pointing out and enthusiastically valuing their ability to solve new and difficult tasks, and a high degree of sharing behavior must be invoked here.

But it may not be enough. The urge to escape may be overwhelming! It is at this point that specific strategies of MLE must be provided to address the level of experienced resistance. A mediational strategy requires a structural plan and attention to critical variables.

Strategies to Overcome Resistance

In the development of MLE strategies, two organizing schemas have been developed. The first reflects the process of engagement as identified in the Prerequisites of Effective Mediation:

- Pursuit: in the face of distraction, habits, and learned avoidance

- Persistence: in the face of resistance, to build crystallization and transformation

- Performance: being active and engaging the learner with experiences

- Penetration: of the learner's cognitive, behavioral, and affective system

These provide a general "systematic" attitude toward the necessity to provide MLE by indicating a basic "posture" of the mediator in response to the manifestation of resistance. When understood, they guide the mediator in orienting responses and in activating the second set of operational parameters for the provision of MLE, focusing on its organized and systematic qualities. To be effective, mediation must be:

- Planful: having an objective, something that the mediator wants to occur, in a specific time/place/sequence

- Systematic: applying interactions in a thoughtful, organized, and articulated manner in relation to well-thought-out goals

- Consistent: using the same techniques in the same ways, for the same behaviors and settings

- Directional: focusing interactions toward goals, orienting responses in light of them, clearly articulating to the learner and "significant others"

Applying MLE to Resistance

Central to both of these conceptualizations is the need to be overt and explicit in responding—labeling the resistance and being clear and optimistic about overcoming it. *"I know you are tired,*

bored, hungry, or frustrated, so we will take a short break, and come back, and I will show you how to succeed, and you will be successful," and so on. The mediator is both optimistic ("*you will succeed*") and persistent *("we will keep working on it, we will not give up*").

The mediator observes the learner's responses to tasks and other dimensions of performance while anticipating initial resistances as a function of dimensions of the task or the learner's "past history" of responding. This observation must be calibrated (adjusted) in light of previous observations and other information that comes from the referral or other descriptions of behavior. It is important to understand the influence of situations . . . where and when the behavior is generated, past experiences and reactions, and the like. With this perspective, diversions can be anticipated and tactically responded to.

The mediator must be willing to create or maintain some disequilibrium in the learner, being both reassuring and demanding at the same time. This is why the need to be open and clear about what is (or will) happen is so important . . . the learner must know why the reaction is being generated, what will happen, and why it is happening (the mediation of intentionality and transcendence). Initial inefficient or incorrect reactions are gently acknowledged, with alternative and corrective responses suggested or taught. The learner is encouraged to imitate and share newly acquired responses. Initial, small indications of the ability to focus and respond to the previously feared or avoided stimuli are noticed, positively commented upon, and reinforced.

As the learner is being "expected" to perform, in spite of the expressions of resistance, the tasks must be structured to indicate competence and overcome resistance. That is, if something is difficult, solutions and skills are taught in such a way as to clearly show the learner that it has been solved and that he or she has the skills to do it. Activities of both the Feuerstein Instrumental Enrichment (FIE) program and the Learning Propensity Assessment Device (LPAD) instruments are organized to present a sequence of cognitive tasks that show variations of repetitions and experiences that address the parameters of MLE. Each task increases in its level of difficulty and novelty while maintaining a similarity. The successful, mediated

experience with such a structure conveys to the learner a sense of competence and accomplishment that is experienced and reinforced throughout the exposure to the tasks.

We cannot predict the time or nature of task exposure necessary to overcome resistance. It may come rapidly or require considerable time, patience, and employment of innovative MLE strategies. The persistence needed to penetrate the learner's system of defenses and avoidance is a natural phenomenon of the process. However, when the learner is "penetrated," many options for mediation and accelerated learning emerge. Working with Damon illustrated this well:

> Damon came to the Institute as a 16-year-old with undifferentiated learning and behavior difficulties, largely of a psychiatric nature. As he was generally unknown to us, we began an LPAD assessment. One of the first instruments used was the Raven Progressive Matrices and Set Variations. He was assessed by a team of examiners, and the goals were as much research-oriented (what does it take to overcome resistance, what are the ranges of possible and effective mediational strategies) as clinical (how to help him modify his behavior). Over the course of 15 hours, spread among a number of sessions, Damon was mediated to stay on task and to respond in spite of his avoidance maneuvers, which revealed excellent social awareness on his part and good interactive skills in several languages. It was clear that many cognitive functions were fragile or deficient and that he could learn to acquire skills or overcome deficit, but that he was very difficult to penetrate. In spite of this, it became clear that he wanted to continue the social encounter, and so he resisted some of the gains that were clearly within his range of skills (both pre- and post-mediation. He prolonged the encounter due to his social needs, and this became one of the mediational strategies that needed to be addressed. However, after more than 15 hours (a much extended time compared to typical assessment experiences), he mastered many complex problems in Set Variations and began to see himself as able to learn and, most importantly, stay focused on the task.

> Damon has remained in the Institute. Many years later, he still recalls that early experience with pleasure. He talks about how hard it was for him to do the early work,

how he learned, and how he can now do such tasks easily and with confidence. It is clear that the early experience and the overcoming of his resistances have stayed with him as an important part of his sense of himself and his capacity to change.

Immediate and Longer-Term Consequences

Learners who have been successfully mediated past the first level of their resistance experience major changes in both performance and attitude. They manifest major changes in motivation, often demanding that they be given more and increasingly difficult tasks in areas that they have just been significantly resisting. They experience a new sense of power, accomplishment, and a great source of pleasure. They are amenable to further mediation, increased demands, and expectations. Most importantly, they are aware of these changes, and mediation of higher-level understandings is possible (mediating a sense of their capacity to change and the optimistic choices which were not previously within their self-perspective). Mira's experience points out these changes and potentials well:

> Fourteen-year-old Mira had been hospitalized in a neuropsychiatric ward of a hospital, evidencing severe symptoms of anxiety and panic such as stomach aches, obsessive worrying, lack of focusing ability, and the like. She had a history of serious learning disabilities as a younger child, and her failure to respond to a variety of special educational interventions and the escalation of her "neurotic" symptoms had led to her hospitalization.

> She was scheduled for a three-day evaluation of her cognitive functions using the LPAD. On the first morning of her assessment, starting with the Raven Progressive Matrices, all of her symptoms were in evidence in full force. Her complaints about being hungry, tired, needing the restroom, and the like came fast and furious and were either responded to with short breaks (and rapid return to task) or explicitly ignored (saying "you can

continue with the task, you can wait awhile," etc.), with both explanations and encouragement. Nonetheless, completing the 12 problems of Level A took the entire morning, a period of approximately three hours.

Upon returning from lunch and seeing the Raven booklet on the table, she exclaimed, with energy and frustration, "Oh no, not more of that red book!" Without much notice of her complaints, the examiner showed her the first problem in the next series, and she quickly pointed to the correct answer. This was repeated for 4 more problems, to which she responded rapidly and accurately. At this point, the examiner pointed out the change: *"Mira, before lunch, it took you 3 hours to work on 12 problems. Here, in a few minutes, you have done 5 problems, and you are accurate, and you are not complaining. You must have learned some important things this morning. Can you show me how you are solving the problems?"* She began, with some mild mediational questioning, to explain her solutions, what information she was using, how she was choosing and differentiating, and the like. She was asked whether she could go on and do more problems, and she agreed. The next 45 minutes were spent finishing Levels Ab and B.

Toward the end of the 45 minutes, Mira asked, *"When we are finished here, can I take the book home with me?"* When asked why she wanted the book, she replied, *"Well, these problems are hard to solve, and I don't think my brother could do them. I want to see if he can."* Upon hearing this, Mira's mother, who had been observing from a corner of the room, literally fell off her chair, then whispered, *"I want to buy the book. I don't care what it costs."* When asked what had just occurred, the mother responded, *"Mira has been angry and jealous of her brother for many years. He is several years younger and is a good learner, and Mira has felt inadequate and non-functioning compared to him. If she wants to show him something that she has learned and see his struggle with it, it would be so good for her."*

The examiner developed an "on-the-spot" mediational intervention. He said to Mira, *"I cannot sell you this book, but I have another one with problems just like it (Set*

Variations). I will give you that book to take home. But you must agree to a plan with me. I want you to show these problems to your brother and keep a journal of which problems he has difficulty with, what the reason for his difficulty is, and how you showed him how to solve the problems. If you keep a good record of this, I will take your journal to Israel and show it to our teachers and use what you have learned to help other teachers help students in learning to solve these problems." When Mira agreed, with evident pleasure and enthusiasm, the mediator said, *"I will be visiting your city in a few months, and I would like to visit you to see how you have done with this plan."* Mira was pleased, and when the visit occurred a few months later, she had followed through well, and most importantly, had changed in her confidence about herself, her attitudes toward learning, and had been able to leave the hospital and return to school, with continued assistance to overcome many long-held blockages to learning.

While Mira's long history of learning and behavioral difficulty did not qualify her reaction to the testing situation as a true "first level" of resistance, the fact that it was treated that way, from an MLE perspective, enabled the mediator to overcome what had been deeply integrated avoidance mechanisms. Mira's experience demonstrates a significant overcoming of long-held resistances. She was able to complete the assessment and was open to many new and previously inaccessible performance demands. The experience did not immediately overcome her cognitive deficiencies and wipe away her years of negative experience, but she was open to mediation. She could be mediated, and she was on her way to acceptance of the need (and positive outcomes) to struggle.

Working with other individuals who have had similar experiences confirms not only the potential for change but also the amenability to do the hard work of cognitive modifiability. Such individuals may temporarily "relapse" into old patterns but respond to reminders and encouragement to orient themselves toward their "new" perspectives. It is a source of great satisfaction for the mediator and for those around the individual so changed. This mutually experienced satisfaction becomes a source of further mediational interactions.

Summing Up

The first level of resistance in a learning encounter may be due to learned avoidance. This has been described as avoiding engagement or investment due to a variety of causes: a past history of failure or stress associated with the tasks, tasks that present the need for skills that are or were developmentally unavailable (but may not continue to be), or a faulty belief system regarding capacity to respond. In the context of positive and adaptive life adjustments, learned avoidance is a protective and enabling condition and can co-exist in successful and otherwise well-integrated performance (occupationally, lifestyle, etc.).

Learned avoidance is amenable to interventions when there is a desire or need to overcome its effects. Mediated learning experience (MLE) is proposed as a vehicle for such interventions and is described with regard to its goals, strategic parameters, and application through the presentation of relevant case study examples. It is in this context that the first level of resistance offers cues to the direction of mediation to overcome the avoidance and provide remedial and elaborative experiences.

References

Feuerstein, R., Feuerstein, R.S., Falik, L. H., & Rand Y. (2002). *The dynamic assessment of cognitive modifiability: The Learning Propensity Assessment Device: Theory, instruments, and   techniques.* Jerusalem, Israel: ICELP Press.

Feuerstein, R., Feuerstein, R. S., Falik L. H., & Rand, Y. (2006). *Creating and enhancing cognitive modifiability: The Feuerstein Instrumental Enrichment Program.* Jerusalem: ICELP Publications.

Krypotos, A.M., Effting, M., Kindt, M., & Beckers, T. (2015) Avoidance learning: a review of theoretical models and recent developments. *Frontiers in Behavioral Neuroscience,* 9,189.

Metacognitive – Music – Motor Training

Umberto Castiglione

Research has shown that children with Specific Learning Disorders (SLDs)—including dyslexia, dysgraphia, and dyscalculia—have inadequate metacognitive skills not only in academic areas but also in memory, study methods, self-assessment, and self-esteem.

Experts emphasize the importance of developing dynamic and metacognitive processes as an essential part of rehabilitation and educational training for these students, based on observed outcomes. In recent years, interest and research in clinical and psycho-pedagogical fields have increasingly focused on the relationship between metacognition and students with learning disorders. Studies have found that these students often lack awareness of their own thought processes, leading to difficulties in executing appropriate strategies, monitoring tasks, and engaging in self-assessment (Lucangeli et al., 2019).

Additionally, children with SLDs struggle to recognize and implement effective strategies, as well as to assess their own work. Research has also highlighted that these students tend to rely heavily on passive and mechanical learning approaches (Cornoldi, 2017). Their repeated experiences of failure in compulsory education, often accompanied by low self-esteem, stem from an inability to find effective learning strategies. As a result, they expend excessive cognitive resources, which diminishes their enthusiasm and the joy of discovery (Dettori, 2015).

I am both a music teacher and a music therapist. My materials can be used in both educational and rehabilitative settings to support children with dyslexia, ADHD, Down syndrome, autism, hearing impairments, learning disabilities, and cerebral palsy.

Through my studies and professional experience, I developed a unique musical training program called *Metacognitive-Music-Motor Training (MMMT)* (Castiglione, 2022). This program integrates theoretical and practical approaches into educational and rehabilitative interventions for students with dyslexia and other special educational needs.

This training is designed for Feuerstein mediators and trainers, speech therapists, doctors, psychologists, educators, support teachers, music therapists, and other professionals in related fields. Some exercises in the program do not require musical skills, while others are preceded by theoretical explanations or preparatory exercises to build foundational knowledge.

The program includes a series of problem-solving activities and musical games that develop various musical elements—such as timbre, pitch, intensity, and duration—as well as concepts of music theory, including notes, the staff, rests, scales, and clefs. Each thematic unit introduces ten different instruments to enhance learning and engagement.

Executive functions play a crucial role in facilitating and reinforcing learning, not only in school but also in various aspects of daily life. They help direct attention to relevant information, inhibit distractions, support the planning and organization of activities, and enhance memory and logical reasoning. Deficits in executive functions have been observed in several conditions, including autism, dyslexia, ADHD, schizophrenia, and conduct disorders. It has been hypothesized that such deficits are linked to various mental disorders, although the specific components of performance functions affected may vary depending on the disorder. Research has demonstrated the fundamental importance of metacognitive processes and a self-regulated approach to studying (De Beni, Moè, & Rizzato, 2003). By strengthening students' awareness of how their minds operate and encouraging them to strategically regulate their cognitive strategies, they can learn to plan, organize, and successfully manage different tasks.

Why Music-Motor?

In recent years, research based on the concept of *embodied cognition* has shown that body experiences and the development and control of motor functions have an essential role in mind or cognitive development. So, motor functions are closely linked to the development of "executive functions"; motor activity per se offers a very good way of soliciting and implementing them: structuring exercises aimed at achieving specific objectives to develop executive skills can be important in the development of children and skill acquisition useful also in other fields, such as school. Starting from these assumptions, the basic idea is to exploit such motor activity peculiarities working on encouraging the performance system. The positive benefits of learning in

general are very dependent on this system for the children's development. This is the way the two subjects converge in a very clear way.

FEUERSTEIN

MOTOR PATTERNS

EXECUTIVE FUNCTIONS

Cognitive flexibilities
Working Memory
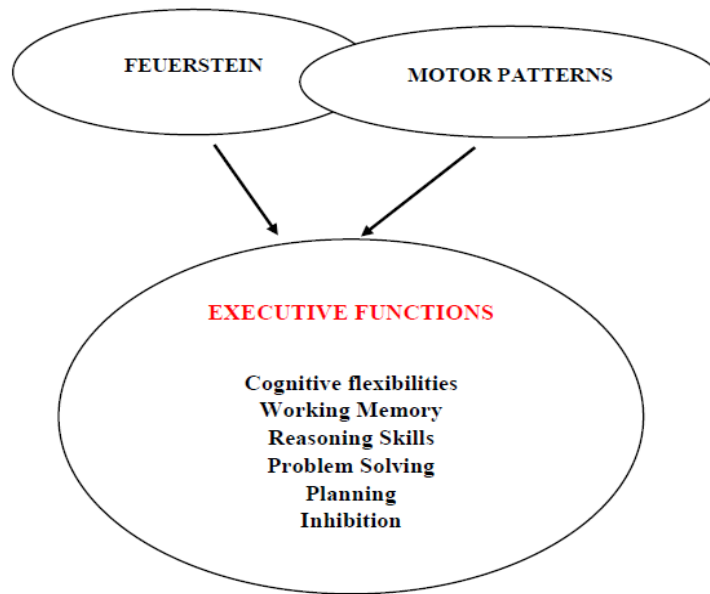Reasoning Skills
Problem Solving
Planning
Inhibition

Fig. 3.1

The learning of motor patterns begins with instinctual or reflexive behaviors. Through highly flexible pre-adaptations, these reflexive behaviors are gradually transformed into deliberate actions as the child explores and identifies behavioral adaptations that bring satisfaction. Intentionality then leads to the development of a plan, enabling the child to self-regulate their body and execute a motor pattern. This ability is also referred to as self-awareness and self-control over one's internal processes and planning skills. Praxis refers to the ability to

carry out a series of coordinated motor actions, ranging from simple to complex, that result in a purposeful and meaningful movement. Praxis develops through three stages:

1. Conceptualization – forming the idea of the movement required to achieve the goal ("what to do").
2. Planning – devising a strategy to reach the objective ("how to do it").
3. Execution – performing the motor actions in a sequential, coordinated manner to ensure effective movement.

Human abilities are generally classified into motor abilities and cognitive abilities. Cognitive abilities are further divided into logical-deductive reasoning and abstraction. Motor abilities, on the other hand, consist of:

- Conditional skills (strength, speed, endurance, and joint mobility).
- Coordination skills (general and specialized).

Cognitive and motor skills can be distinguished based on whether motor or cognitive components are more dominant. In motor skills ("how to do"), decision-making processes are minimized, while the quality of movement itself, along with motor control, becomes the primary focus.

In cognitive skills (*"what to do"*), progress in decision-making and problem-solving is crucial. For example, in sports, executing a technically perfect pass is often less important than making the right tactical decision—choosing whether to pass, whom to pass to, whether to shoot, or whether to continue the play.

In recent years, the metacognitive approach has been applied to the motor field to help children and teenagers develop the ability to control and plan their behaviors. Research on this ability in relation to motor skills has only recently begun (Rabaglietti et al., 2009). This approach builds on the well-established understanding that knowledge of and control over cognitive processes—as conceptualized through metacognition—play a crucial role in academic learning.

As Rabaglietti et al. (2009) state, "The success of motor performance lies in the combination of cognitive and motor skills and their interaction with affective-relational areas." Consciously engaging in the learning process allows individuals to solve motor problems in a way that aligns with their goals. This process relies on neurological, physiological, and psychological factors that enable students to learn, organize, control, and adapt movement.

Rabaglietti proposes an exploratory investigation into whether a principle similar to metacognition also underlies motor learning and behavior. In one of her recent studies, she introduced the neologism "metamotricity", defining it as "a second-level motricity, or the set of activities related to motor awareness and control" (Rabaglietti et al., 2009).

The Role of the Body in Musical Learning

Music education fosters a type of learning that extends beyond theoretical knowledge to include practical and sensory experiences. The body plays a fundamental role in this process, as all perception originates through it. When playing music, the nervous system is activated, and the muscular system engages, allowing the brain to learn functions through physical actions.

The body is the primary organ of perception, actively participating in every sensory experience. As Piaget demonstrated, mental operations develop through a progressive internalization of bodily experiences. Motor activity enhances all types of learning. Musical concepts take shape in the mind when words are linked to experiences that engage both hearing and the entire body. Abstract concepts and the ability to control musical experiences emerge from synesthetic interactions between sound and other senses.

Musical games provide children with an engaging way to learn skills such as reading, writing, and logical-mathematical reasoning—without directly focusing on technical instruction. These activities also support the development of indirect skills. Sound and music offer extraordinary learning opportunities, and the role of the body is essential in educational settings.

Educating the body through music and using the body to develop an appreciation for music is an ancient educational philosophy that values the person as a whole. This approach can serve

educational, developmental, and therapeutic purposes, reinforcing the deep connection between movement, perception, and learning.

The **body, mind, and music** are deeply interconnected. Together, they form three essential elements for **self-expression, well-being, and personal development**. The combination of **music and movement** goes beyond simply moving to a rhythm. Developmental psychologists, such as **Jean Piaget (1950),** emphasize that early sensorimotor experiences are crucial for developing **body awareness and learning**. Integrating music and movement—both as a single experience and as complementary elements—enhances **attention, concentration, memory, spatial and body perception, social interaction, imagination, and creativity** (Dalcroze,2009; Martinet, 2008). The connection between **movement and development** is also central to **Maria Montessori's** educational philosophy (Montessori,2022). She states, **"When the child starts moving, their absorbent mind has entered the world."** If children receive proper stimulation, they instinctively understand *what* to do and *how* to do it—without relying solely on intellect.

Neuroscientists have found that **coordinating both hands, either together or independently, significantly increases gray matter** because both cerebral hemispheres are engaged. Musicians must also **read and interpret musical symbols simultaneously**, requiring precise coordination between the brain's hemispheres. Playing an instrument **alters brain structure**, accelerating **nerve impulse transmission**. This is due to an increase in **myelination**—the formation of myelin (white matter), which enhances communication between neurons. As a result, musicians develop the ability to move their fingers independently and strengthen the **neural fibers connecting the auditory regions of both hemispheres**.

White matter consists of specialized cells that **transmit information between neurons across different brain regions**, essentially acting as the **wiring of the central nervous system**. Playing an instrument is one of the most cognitively demanding activities a person can engage in. It simultaneously activates multiple areas of both the **central nervous system (brain and spinal cord)** and the **peripheral nervous system**.

During instrumental performance, different brain regions work together:

- **Motor areas** control the fine and gross movements required to produce sound.

- **The auditory system** processes the sound and, based on the input received, helps regulate motor functions.
- **Visual information**, such as reading sheet music, is transmitted to the brain for processing and execution.

Scientific research shows that playing an instrument **alters brain function even after just fifteen months of training**, especially when introduced in early childhood. These changes are primarily due to the enhancement of **motor and auditory skills**. One of the most affected brain regions is the **hippocampus**, which plays a key role in **learning and memory**. Playing an instrument stimulates **neurogenesis**, the process of generating new neurons in the hippocampus. This is a critical factor in **learning and memory formation**. Musical training has been shown to **increase neurogenesis, enhance cognitive abilities, and improve overall brain function**. In short, **playing an instrument is a full-body workout for the brain**, engaging multiple neural pathways and reinforcing essential cognitive and motor skills.

Scientific research has confirmed a direct relationship between motor and cognitive development (Zatorre & Peretz, 2001). Academic success and performance on tasks and tests depend on factors closely related to school achievement, such as attention, concentration, memory, and the ability to recognize and understand information. These cognitive abilities can be either enhanced or diminished by various influences. Certain factors positively impact academic performance, including memory, attention, personality, and self-esteem. Conversely, factors such as obesity and media addiction can have negative effects. Studies indicate that for children to effectively engage in learning, they must activate their body, mind, and sensory experiences simultaneously.

Modern neuroscience increasingly supports Maria Montessori's theories with scientific evidence and data. Motor development is closely linked to learning, particularly in tasks that involve spatial awareness and writing. For example, Broca's area, a brain region responsible for processing memory, is activated not only for writing but also for acting and speaking. Therefore, allowing children to express themselves freely—especially through movement and hands-on activities—facilitates learning, including writing and logical reasoning.

Research suggests that the cerebellum—particularly its posterior lobe—plays a key role in cognitive functions. These include Visual processing and optimization, Planning and executing actions, Abstract reasoning, Working memory, Attention and cognitive flexibility, Spatial organization, Language functions, and prosody. Miles & Westcombe (2008) suggested that mild cerebellar deficits may explain why some individuals with dyslexia struggle with coordination and motor skills. Some dyslexic individuals may lack rhythm and motor coordination, which could stem from cerebellar dysfunction—even when they possess musical talent. The "cerebellar model" proposed by Nicolson, Fawcett, and Dean (2011) supports this idea. According to their theory, dysfunctions in sequential skills—such as motor, linguistic, organizational, and spatial-temporal abilities—originate from a cerebellar deficit. This deficit contributes to slowness in processing and phonological difficulties.

The cerebellum is essential for general motor control, regulating at least three fundamental processes: Motor coordination, Sequencing of movements, and interhemispheric communication. For years, neuroscientific research has emphasized the connection between motor and cognitive functions. Institutions and universities worldwide have demonstrated that specific motor patterns can enhance neural connectivity and improve cognitive functions related to attention, creativity, reasoning, and reading. As a result, a variety of musical neuromotor practices have been developed, based on "Motor Sequences" (or "Motor Progressions"), to stimulate brain development and cognitive abilities.

(See Appendix 1 for MMMT variations of such FIE tasks as Comparisons, Orientation in Space, and Progressions.)

Music promotes multisensory and multimodal experiences (Combined instruments)

Dyspraxia affects a child's ability to perform multiple tasks simultaneously. A child with dyspraxia may struggle with listening to explanations while taking notes, copying from the chalkboard, executing two different movements at the same time, or remembering more than two or three instructions at once. Multisensory learning involves engaging two or more senses during

the learning process. "Multisensory integration", also known as "multimodal integration," refers to the way the nervous system combines information from different sensory modalities, such as hearing, touch, smell, and motor perception. This concept has been widely studied in neuroscience, cognitive science, and behavioral science. Research shows that multisensory stimulation enhances attention and concentration in children. Regularly engaging all five senses helps children navigate daily life at home and school with greater awareness, calmness, and overall well-being.

In the early 20th century, Orton and Gillingham developed a multisensory phonetic technique for corrective reading instruction (Driscoll, 2024). Their method emphasizes teaching students how letters and letter combinations correspond to sounds. Key elements of these programs include: Reading aloud to engage both visual and auditory senses and writing to incorporate motor movement, reinforcing learning through kinesthetic involvement. Extensive scientific research on learning has demonstrated that the human brain is naturally wired to develop, learn, and function best in multisensory environments.

Playing a musical instrument requires the integration of auditory, visual, and motor coordination skills. To be effective, music instruction must be adapted to each child's unique needs. One key musical exercise is "polyrhythm," which involves performing multiple rhythms simultaneously. A musical measure has a precise duration, which can be divided into different rhythmic subdivisions while maintaining the overall timing. The challenge lies in executing these subdivisions at the same time.

Practicing an instrument requires organizing spatial and temporal events, as well as managing space-time windows—the ability to anticipate and execute actions at precise moments. To do this, a student must develop:

- Psychomotor skills involving both global and fine motor coordination.
- Hand dominance and body control.
- Cognitive skills such as attention, analysis, and synthesis.
- Logical-mathematical reasoning.
- Symbolization—the ability to interpret and produce musical notation.

In music, a phrase is formed by a sequence of connected musical elements. It can be understood as a set of gestures logically linked to one another. When one movement leads naturally into the next, they form a coherent musical phrase. This interconnectedness mirrors the way motor and cognitive processes interact, reinforcing the brain's ability to coordinate complex actions through structured, rhythmic movement.

Therapeutic musical activities can be used individually or in combination and fall into three main categories: Singing, playing an instrument, and coordinating movement with music. These three activities promote brain-body integration by simultaneously engaging multiple cognitive and physical functions, including language development, coordination, and auditory perception. At first, combining these activities might seem complex or chaotic. However, research shows that singing, playing an instrument, and moving to music simultaneously actually reinforce one another. When these activities are integrated, the synergistic effect of a multisensory approach enhances learning.

Playing an instrument is a comprehensive brain workout. Neuroscientists have observed that multiple brain areas activate rapidly and simultaneously during musical performance. Specifically, playing an instrument engages the visual, auditory, and motor cortices, requiring both cerebral hemispheres to coordinate motor control precisely. Unlike simply listening to music, actively playing an instrument demands fine motor skills and controlled movements, making it a far more engaging and beneficial activity for brain development. Moreover, regular musical practice has been shown to improve cognitive abilities that extend beyond music, benefiting memory, attention, and problem-solving skills.

Working memory difficulties are common in children with learning challenges, particularly those with dyslexia and attention disorders. These difficulties manifest as forgetting instructions and sequences (e.g., the alphabet, months of the year, days of the week, seasons), struggling to recall names, technical terms, grammar structures, or mathematical formulas, and having weaker short-term memory, which significantly impacts learning. Because dyslexic individuals often experience pronounced short-term memory deficits, it is crucial to use multisensory learning strategies that incorporate visual, auditory, and motor stimulation. However, learning becomes most effective when multiple sensory pathways are activated simultaneously. The more diverse

and interactive the learning process, the more stimulated the brain becomes, laying the foundation for stronger long-term memory retention.

The MMMT "**Combined Instruments"** is made of about 170 cards; each card is related to activities associated with two to five MMMT variants of FIE instruments. For example, the voice (singing) is related to "*Temporal Relations*", the right hand to "*Spatial Orientation"*; the left hand to "*Classifications",* and foot movements are related to "*Progressions".* Sitting down allows to related to two instruments - one for the right foot and the other one for the left one.

See the examples of "Combined Instruments in Appendix 2.

Music therapy can be an effective tool for achieving developmental, educational, and supportive goals for individuals with disabilities. It can help improve attention, concentration, organizational skills, memory, sequential and simultaneous processing, and problem-solving abilities. Several clinical cases demonstrate improvements in attention and concentration, short- and long-term memory activation, the ability to organize sounds into patterns and phrases, and connecting different experiences through associations.

Certain principles guide interventions for individuals with Down syndrome, particularly those incorporating physical activity. Regular exercise serves a preventive function, promoting overall physical health and psychological well-being by fostering a sense of capability and accomplishment. When focusing on cognitive development, we sometimes overlook the fact that individuals with Down syndrome, like everyone else, require a balance between learning and recreation. Learning activities engage a child's energy to meet external demands. Recreational activities fulfill personal needs, helping to relieve tension and prevent frustration. Addressing recreational needs is essential, as it allows individuals to release stress accumulated during learning and provides fulfillment that might otherwise be lacking.

Using basic psychomotor exercises, such as walking and running at different speeds, along with rhythmic activities, can enhance body awareness. This approach also helps in developing concepts of space and time and understanding behavioral rules. One effective method involves practicing rhythms with a xylophone. Begin at a normal pace, gradually increasing speed. Repeat the sequence multiple times to reinforce performance and build confidence. Gradually reduce

pauses between repetitions, challenging students to respond more quickly. This process allows teachers to observe and assess flexibility, coordination, and overall psychomotor development. Slow-motion activities encourage body control and balance awareness, while rhythmic exercises improve audio-motor coordination and attention. Over time, comprehension of assigned tasks improves, and the time required to complete them decreases. Music-motor training aims to modify cognitive behaviors by emphasizing behavioral profiling and attention development.

Significant data indicate that this approach enhances attention skills in individuals with Down syndrome. These findings reveal an improved ability to engage perceptual channels and a need for further development of essential attentional skills. The results confirm that, with the right tools and strategies, significant progress can be achieved in cognitive processes such as attention, motivation, and learning. Participants showed enhanced attentional control, demonstrated by improved comprehension of tasks and decreased time required for task completion. Ultimately, this approach underscores the potential for cognitive and behavioral improvement through structured music-motor interventions.

MMMT variant cards and combined instruments

"Variant" cards and "combined instruments" organized as play activities can foster an emotionally welcoming and playful environment where children learn while having fun. Delalande (2004) points out that musical exercise and play are similar. In fact, the sensorimotor game has an adaptation function: the child masters the external context through gestures. When motivation is present, behavior ceases to be mechanical and becomes lively practice. Teaching through practice has been contrasted with traditional teaching methods. Delalande applies this concept to music and identifies three key dimensions of musical practice: The search for sensorimotor pleasure, symbolic investment in the instrument linked to lived experience, and intellectual satisfaction derived from the structured rules of musical play.

When a student is motivated, they experience new situations—including musical ones—as opportunities for growth, behavioral maturity, and innovative exploration. The connection between emotions and Specific Learning Disorders (SLD) is particularly strong because emotions play a crucial role in how a child copes with academic challenges. Throughout the

school year, children with SLD often exhibit distress signals, including somatic complaints (e.g., stomachaches, headaches) when going to school, crying or refusing to participate in activities that cause discomfort or humiliation, aggression toward peers, distractibility in class and difficulty focusing on schoolwork, social withdrawal, and isolation. They frequently avoid activities that come easily to their peers but feel like insurmountable obstacles to them.

Among the most common emotional responses in children with dyslexia is anxiety. The frustration of struggling with tasks that others find simple can also lead to anger, as they feel misunderstood. Shame is another prevalent emotion—many children with SLD feel inferior or different from their classmates. These emotional struggles can create a vicious cycle that impacts self-perception and academic performance: Low self-esteem, distorted self-concept, and reduced sense of self-efficacy. Ultimately, these factors may contribute to school failure if not properly addressed.

Play fosters enjoyment and promotes psychological well-being, helping children overcome shyness and emotional repression. Rhythmic activities, in particular, provide a unique form of neuromotor pleasure. The synchronization of movement with rhythm creates a link between action and anticipation, excitement and order. This principle also helps explain the soothing effect of lullabies—their steady rhythm has a cohesive and regulating force that encourages synchronized movement and emotional balance.

Metacognition and movement in relation to language

Cognitive functions such as thought, learning, and language are deeply interconnected. Vygotsky (1990) described the relationship between thought and language as a dynamic process—thought moves toward language, and language, in turn, shapes thought. He argued that language is not just a tool for expressing thoughts but also a mechanism for organizing and regulating cognitive processes. In his book *Thought and Language*, Vygotsky explains that language allows individuals to structure their thoughts in relation to reality and experience.

Ayres (1985, 2012) explored the correlation between motor and perceptual development, particularly in cases of sensory integration disorders. According to her, dyspraxia—defined as a "disorder of sensory integration"—causes deficits in motor programming. Even though children with dyspraxia may have normal muscle function and intelligence, they lack the neural connections (the "bridge" between the intellect and the muscular system) necessary for coordinated movement. Portwood (1996) expanded on Ayres' findings, showing that 44% of children with dyspraxia also have dyslexia, and there are additional links to ADHD, autism, and Down syndrome. She attributed these difficulties to neurological immaturity in brain areas responsible for motor and cognitive activities. Even when a correct movement occurs, these children struggle to consolidate and remember it due to reduced brain plasticity.

Aram and Horwitz (1983) studied verbal dyspraxia, focusing on how affected children organize actions and thoughts. They found that Sequential difficulties in children with verbal dyspraxia appear primarily in verbal tasks but also extend to non-verbal sequential tasks. For example, when asked to organize a series of pictures into a story, even without requiring a verbal response, children with verbal dyspraxia struggle with time-space organization. This suggests that their difficulty is not just in the physical planning of speech movements but also in the conceptual organization of sequential information at a metacognitive level.

A core challenge in dyspraxia is planning—both in movement and cognition. Individuals with dyspraxia experience difficulties in organizing, sequencing, and executing a series of movements to achieve a goal. This deficit extends beyond motor control to impact problem-solving, decision-making, and structured thinking, further reinforcing the connection between motor coordination, cognition, and language development.

In verbal dyspraxia, the main impairment lies in planning the space-time parameters of speech movements within the speech articulation system. The child has poor control over these movements, leading to difficulties in sequential organization. While the child can produce isolated sounds, they struggle to sequence them into syllables and words. Their speech is often slow and fragmented, especially with longer words, as they tend to articulate words syllable by syllable instead of fluidly combining sounds.

The ability to plan and organize sequences—whether in speech or other cognitive tasks—relies on metacognition, or awareness of one's own learning processes. A child with verbal dyspraxia may have difficulties because their brain struggles to create, store, and retrieve structured movement patterns for speech.

Feuerstein's FIE includes cognitive exercises designed to improve sequential processing and logical structuring. Some key instruments include: Numerical Progressions help to develop pattern recognition and the ability to organize sequences logically. Temporal Relations strengthen understanding of time-based sequences (before/after relationships), which is essential for structuring speech and thought. Instructions encourage following multi-step directions, reinforcing executive function and planning skills.

By training these cognitive functions, children with verbal dyspraxia can improve their sequencing abilities, not only for speech but also for broader learning and problem-solving skills

Language and Movement

Language is fundamentally **a form of movement**, as it arises from **the coordinated action of mouth muscles** involved in phonetic articulation. **Bodily and gestural actions** play a crucial role in neuromotor development and, consequently, in the emergence of language. Several studies highlight the strong correlation between motor, cognitive, and social development on one side and language acquisition on the other. Research has shown that gestures facilitate and accompany the development of vocal articulation. Thelen (1979) demonstrated a direct correlation between rhythmic arm movements and the onset of babbling ("bababa") in infants. Around 28 weeks of age, babies experience a peak in arm movements (shaking, swinging, beating), which coincides with the emergence of duplicate babbling. This suggests that motor **and vocal development are interdependent,** with kinesthetic feedback playing a role in speech acquisition. **Vocal and motor kinesthesia are interconnected: Smooth, coordinated movements** are associated with **fluent, expressive speech and melodic singing. Tense, nervous movements** often accompany **rigid, abrupt speech patterns.**

Maria Montessori emphasized the connection between **movement and cognitive development**, a view now backed by **neuroscientific research: Motor development influences learning.**

Brain areas responsible for **spatial awareness** are also engaged in **writing and other cognitive processes. Broca's area,** which is crucial for **speech production**, is also involved procedural **memory** (storing sequences of movements)**.** Children should be **encouraged to move freely and engage in hands-on activities**. **Dexterity and motor experiences** support **writing development and rational thinking. Gestural communication** can aid in **early language acquisition** and **learning processes.** By integrating **movement into learning**, we can **enhance language development and cognitive growth**, providing a **holistic approach to education.**

Metacognition applied to reading-writing

Music is a powerful tool for enhancing motor skills, cognitive functions, and linguistic abilities. It not only helps children understand their own bodies through coordination and motor orientation but also plays a crucial role in developing phonetic, verbal, and mathematical skills. Through musical games, children engage in indirect learning of reading and writing skills, mathematical logic and calculations, study techniques, soft skills such as creativity, discipline, and problem-solving. Music and sound provide a unique and effective learning experience, fostering sensory integration and cognitive flexibility.

Research shows that musicians activate both brain hemispheres, whereas non-musicians primarily activate the left hemisphere (left occipital-temporal cortex and left lower occipital cortex). For dyslexic children, activating both hemispheres can compensate for impairments in the areas responsible for visual word analysis, helping them improve their reading abilities (see "Music for Dyslexia" by Castiglione, 2018). A study led by Mado Proverbio (2019) revealed that musicians develop a specialized area in the right occipital cortex for recognizing musical notes, which does not exist in non-musicians. This musical processing area can also be used for reading words. In dyslexic individuals, this area can compensate for functional deficits in the left hemisphere, helping them read more effectively. Learning music strengthens neural pathways associated with reading. Studying music can reduce the severity of phonological dyslexia by activating an alternative reading area in the right hemisphere. This compensatory mechanism helps dyslexic children develop stronger reading and phonological processing abilities. Music is not just an artistic or recreational activity—it is a powerful cognitive tool that enhances reading skills, motor coordination, and overall brain function. Especially for children with dyslexia,

music provides a neuroscientific advantage by stimulating brain plasticity and fostering alternative pathways for learning.

Children who struggle with pronunciation and fluent reading can benefit significantly from rhythmic structures in language training. Rhythmic exercises help regulate speech patterns, improve reading fluency, and enhance writing skills through structured didactic-linguistic training. Studies show that children with weaker base skills tend to have lower metacognitive control. This suggests a direct connection between cognitive skills and metacognitive awareness. Metacognition is the ability to reflect on one's own thought processes and learning strategies. Children who develop strong metacognitive skills can better manage their reading and writing challenges. Recent research highlights the benefits of metacognitive didactic activities in supporting children with Specific Learning Disorders (SLD), particularly in reading and writing. Assessing metacognitive levels early on can help identify potential learning difficulties in primary school. Developing metacognitive strategies can serve as a compensatory tool to facilitate learning and overcome challenges related to SLD (Cornoldi, 2007).

The Feuerstein method is effective in helping dyslexic children improve their reading skills—not simply by working directly with syllables and words, but through indirect cognitive training. It enhances cognitive functions through a variety of structured exercises. Activities focus on high-order thinking skills, problem-solving, and pattern recognition, which in turn support reading and writing development. By introducing metacognitive training as early as nursery school, we can make reading and writing development easier and more enjoyable through fun, engaging activities. This approach not only strengthens learning processes but also fosters long-term cognitive and linguistic improvements for children with dyslexia and other learning difficulties.

Analytic Perception
Objective: *Identifying the parts of a whole and reassemble them in a new unity, transitioning with flexibility from analysis (writing) to synthesis (reading) and from synthesis to analysis.*
In meta-phonological activity, the student develops the skill of splitting up sentences in words, words into syllables, and syllables into phonemes.

Numerical Progressions

Objective: *Discover the rules governing a sequence of events in order to be able to predict. T*his objective helps students seek, deduce, and infer relations between objects.

This tool reinforces the concepts "before and after" as in the following assumption: consonant "m", prepare your mouth for "p" and "b"; the confirmation is in the rule: before "p" and "b" "m" is required; the same for "gn" or "qu".

Temporal Relations

Objective: *Using fluently the concepts related to time*

The tool includes exercises that require the identification of cause and effect, means-end relations based on linear time, and, at the same time, the development of divergent and hypothetical thinking. (*if you study you will pass*)

Instructions

Objective: *Coding and decoding implicit and explicit instructions.* The attitude of poor planning and inadequate attitude to sequence one's own actions, could generate a wrong execution of instructions. Writing has some rules to follow, it is necessary to teach the different movements needed to write the alphabet letters.

When in the first primary class the teacher shows the letter "a" in cursive: it is written with a small bar in the lower left going up to the right, a counter-clockwise round which closes and a little leg coming down.

Orientation in Space I and II

Objective: *Develop a system of fixed orientation, combining it with the reference system of one's own body scheme.*

The counter-clockwise or levorotatory direction to write letters or circular numbers; reading as well as writing go from right to left, when I read and start a new paragraph I move from right to left.

Comparisons

Objective: developing the ability to make comparisons spontaneously based on several criteria. "Perceiving" is nothing more than comparing two elements in order to notice the difference. So perceiving means to compare two interrelated elements: "it's" and "its"; "f" and "v"; "p" and "b; "m" and "n" are nexuses which cannot be confused with each other.

Transitive Relations

This instrument develops the relationships between elements of a whole whose differences are expressed as "greater than" "less than" or "equal to".

Example:

volume = book;   bee > be;   light (adj) ≠ light (n)

Classifications

Objective: *organizing the data collected in main categories.*

This instrument is based on the ability to compare, to distinguish, and to discriminate.

This is an essential ability for basic logic and verbal operations.

Classifying following a principle: verb tenses; direct-indirect speech; words with doubles; accented words; homophone and homograph words.

Syllogisms

Objective: Through exercises with syllogisms, students achieve the ability to distinguish and classify between good and bad conclusions and between possible and inevitable consequences.

Music metacognition and mathematics

Music and mathematics share deep structural connections. Both disciplines rely on patterns, relationships, and logical structures, making them interdependent fields of study. Harmony and composition are based on mathematical ratios and proportions (e.g., the Pythagorean scale). Rhythm is fundamentally numerical, as it involves timing, counting beats, and sequencing. Musical notation functions as a symbolic system, similar to mathematical formulas, that

transcends spoken language. In the Middle Ages, music was considered a scientific discipline and was part of the Quadrivium (alongside Geometry, Arithmetic, and Astronomy). This highlights how, historically, music was seen as an essential mathematical and intellectual pursuit. Kinard and Kozulin (2005) argue that mathematical thinking requires more than mechanical calculations. Their study integrates Vygotsky's sociocultural theory (which emphasizes psychological tools in learning) with Feuerstein's mediated learning approach. The key insight: True mathematical competence comes from conceptual understanding, logical reasoning, and creative problem-solving—not just memorization.

A music-based approach to learning mathematics could enhance pattern recognition and problem-solving skills, foster logical and creative thinking simultaneously, and make mathematical concepts more engaging and intuitive. By reviving music as a core educational subject, we can reinforce both cognitive and mathematical abilities, ultimately creating a more well-rounded and effective learning experience.

(See Appendix 3)

Metacognitive-Musical-Motor Training in ADHD Treatment

ADHD (Attention Deficit Hyperactivity Disorder) affects a child's attention, impulse control, and executive functions, often leading to learning difficulties and motor coordination issues. A MMMT approach integrates music, movement, and cognitive strategies to enhance focus, self-regulation, and executive function skills in children with ADHD.

ADHD is linked to structural and functional differences in key brain regions responsible for impulse control, attention, and executive functioning. Neurobiological studies show dopamine deficiency as a core issue, leading to difficulties in self-regulation, sensory processing, and inhibition. Music, particularly rhythmic exercises and movement-based activities, can help regulate cognitive and emotional functions by stimulating cortical and subcortical brain areas, including the prefrontal cortex, basal ganglia, and limbic system. This stimulation helps children with ADHD develop better focus, impulse control, and relaxation skills. Music contains natural elements of tension and relaxation, which can be used to help children manage hyperactivity and restlessness. Active musical participation (drumming, movement to fast-paced rhythms) allows children to release excess energy in a structured way. A gradual transition to passive relaxation

(listening to slower music, guided breathing with rhythm) helps children learn to self-soothe and regulate arousal levels.

Many ADHD children struggle with waiting, delaying responses, and controlling impulses. Musical exercises using rhythm and timing can train self-regulation skills. Turn-taking exercises – The child plays a rhythmic pattern on a drum only when it's their turn, reinforcing patience and impulse control. Rhythmic Progressions – Sequences like clap-clap, stomp, clap-clap help train motor planning and inhibitory control. Call-and-response drumming – The therapist plays a rhythm, and the child must wait, listen, and repeat, strengthening auditory processing and focus. ADHD often involves difficulty in sustained attention and auditory processing. Music therapy can train selective attention and working memory. Structured rhythm exercises require the child to internalize and reproduce patterns, reinforcing sequencing skills and cognitive flexibility. Listening games with music (e.g., freeze dance, musical Simon says) train the brain to process external cues and adjust behavior accordingly.

Music influences the limbic system, which regulates emotion and mood. Children can use music to express frustration, anxiety, or excitement in a nonverbal way. Relaxing music activities (e.g., guided musical breathing) can help reduce anxiety and promote self-soothing. Music therapy, particularly when combined with movement-based activities and metacognitive strategies, provides a fun, engaging, and scientifically backed approach to helping ADHD children improve attention, impulse control, and emotional regulation.

See Appendix 4.

Conclusion

In music therapy it is important to identify the other's needs, to listen to find out what is out of place inside oneself. Under these conditions, music therapy has been introduced in schools. Actually, it shouldn't be considered only as a therapy to solve existing problems but also as a tool to activate the learning process as a whole. Damasio (2000) compares the functioning of the human body to an "orchestra chore": the behavior of a person in his/her physical and psychic dimension comes out from the concurrence of different melodic lines, which result from multiple instruments. When harmony breaks, we are in disharmony: difficulties in relationships, in speaking, praxis, in articulating gestures, in coordination complexity without orders, and in

organization. In music and/or music therapy, there is the chance to relate to the person to tend towards the renewed order.
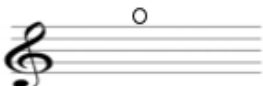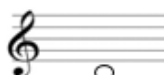
Appendix 1

Musical versions of Standard FIE instruments

Comparisons

In two.
The mediator plays (A and B); the student after listening, completes.

1   **A**   **B**

Common: value

Different: high   **Different: low**

2

Common: name

Different: long   **Different: short**

- Modality: Listening;
- Musical Objectives:
    - Develop listening and attention skills
    - Developing auditory memory and short-term memory
    - Recognizing the position of notes
    - Recognizing the musical values of notes
    - Intuit the characteristics of sound by discriminating it according to pitch.

Orientation in Space

At the sound of the drum, you move forward; at the sound of the sticks to the right; at the sound of the triangle backward; and the sound of the maracas to the left. (The 4 pictures are placed on the floor).
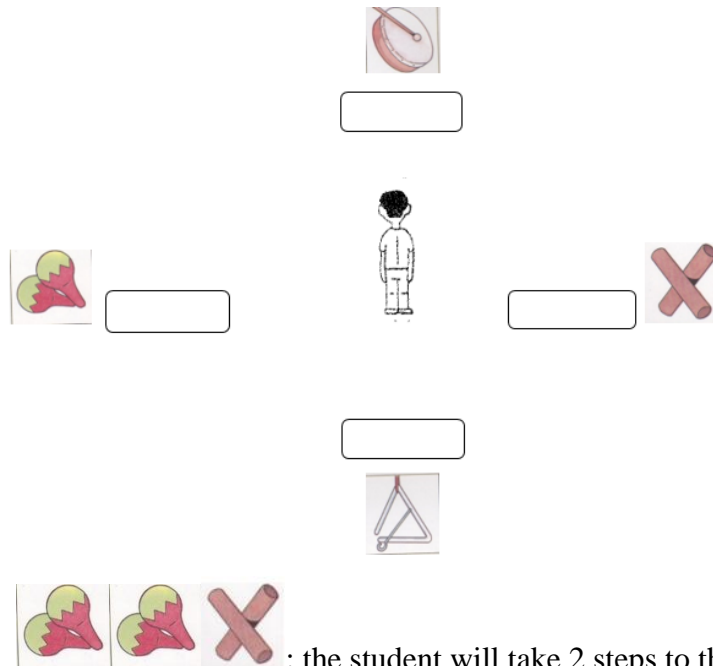
The mediator plays : ; the student will take 2 steps to the left and 1 step to the right. After the student has consolidated the exercise, the facilitator removes the figures from the floor, the student will perform the exercise from memory.

1

Motor Progressions

Formula: Hands right,right,left; Feet right, right

	Right right left	right right left
Hands		
Feet	right right	right right

repeat
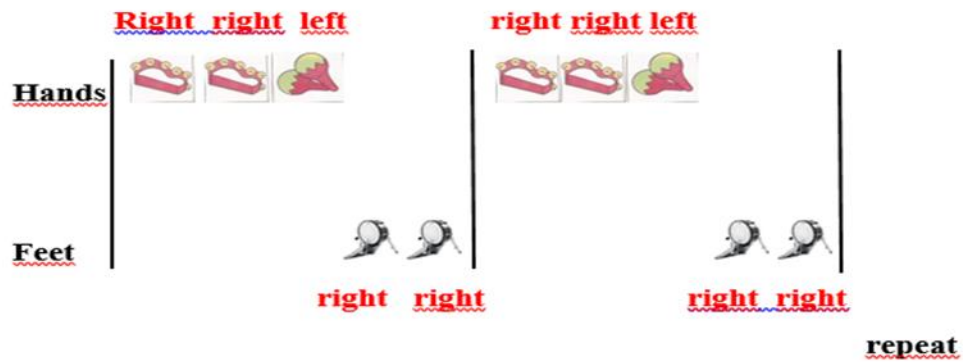
2

Cross Movement

Motor Progressions

Formula: right drum and left bass drum / left drum and right bass drum

repeat
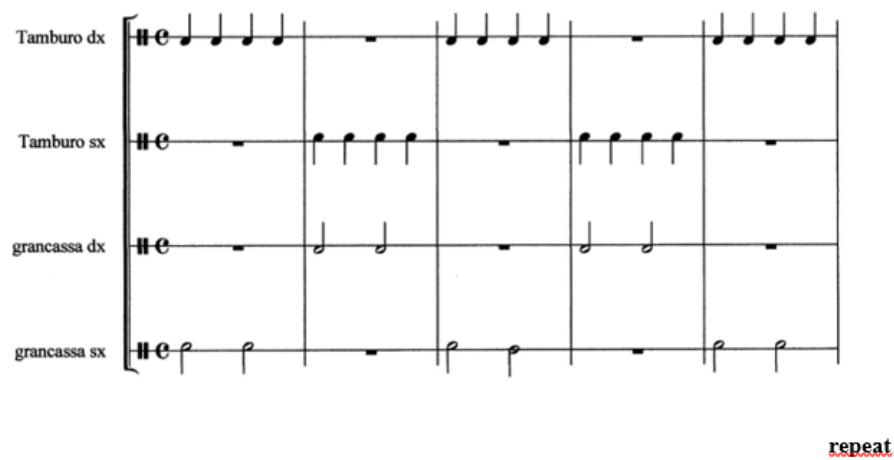
Appendix 2

Combined instruments

MUSIC SCORE

VOICE	TEMPORAL RELATIONS
RIGHT HAND	CLASSIFICATIONS
LEFT HAND	SPATIAL ORIENTATION II
FEET	PROGRESSIONS
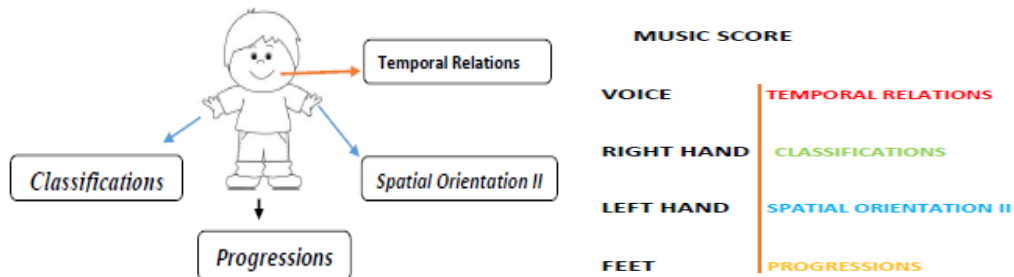
Multisensory -Multimodal

Combined Instruments

Progressions- Temporal Relations - Spatial Orientation I - Spatial Orientations II

Voice and Movement

The student has to walk baed (Spatial Orientation I) and pronounce or sing, repeating the musical sequence: (c-d-e-f; Temporal Relations- Progressions); with the right or left hand he will play the 4 cardinal points clockwise on the drum; (Spatial Orientations II north east-south west).

Drum

Instructions page 4 number 2
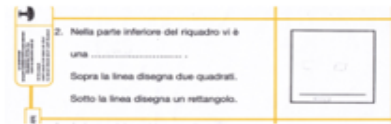
Over the left semibreve, write an increasing progression made of three notes developing towards right.
Under the right semibreve, write a decreasing progression made of three notes developing towards left.
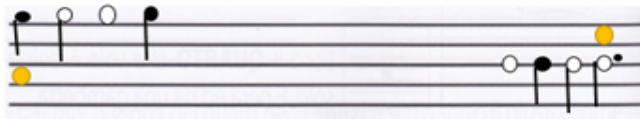
Combined Instruments
Numerical Progressions-Spatial Orientation I
Joseph; Down Syndrome 13 years old

Formula: (+2-1) (according to the music, the boy must make 2 steps forward and 1 step backwards)

C	E	D	F	E	G	F	A	G	B	A	C	B	D	C	E	D	F	E	G
1	3	2	4	3	5	4	6	5	7	6	8	7	9	8	10	9	11	10	12 etc.
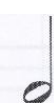
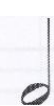**Appendix 3**

MMMT cards for mathematics

Transitive Relations

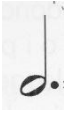The symbol = means equal or equivalent

The symbol ≠ means different or not equivalent

Write the symbol "equal" or "different" to describe the following relations. Give an explanation

 because…….

 because…..

 because…

Analytic Perception

Each note on the left column matches a note on the right column, which completes the note on the top of the page. Write the number and the letter of the two sets to form the complete figure.
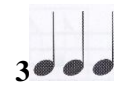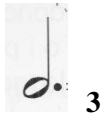

1

1 - D

_____

2

_____

3

_____

4

_____

A

B

C

D

Appendix 4

1

Numerical Progression

Formula: ● To play piano; ⬤ To play forte; Tr…… Trill

Luca Marco Chiara   Luca Marco Chiara

Repeat

2

Numerical Progressions

Formula: ●● student; ●●●● mediator

student   mediator   student   mediator

slow –fast –slow   fast–slow–fast

progression continues
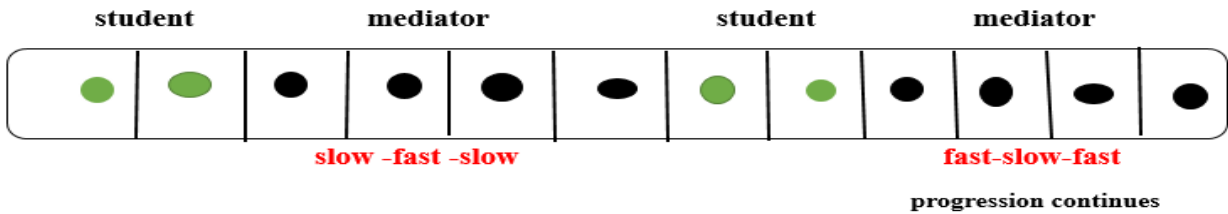
3

Numerical Progressions

Formula: Mediator-Roberto- Chiara-Luca

progression continues

Bibliography

Aram, D. M., & Horwitz, S. J. (1983). Sequential and non-speech praxic abilities in developmental verbal apraxia. *Developmental Medicine & Child Neurology*, *25*(2), 197-206.

Ayres, A. J. (1985). *Developmental dyspraxia and adult apraxia*. Torrance,. CA: Sensory Integration International.

Ayres A.J.(2012)."*Il bambino e l'integrazione sensoriale. Le sfide nascoste della sensorialità*,"Giovanni Fioriti Editore,

Castiglione, M.U., (2018). *Le musiche per la dislessia. Elementi teorici per il trattamento educativo-abilitativo*,   Armando Editore, Roma.

Castiglione, M. U., (2022). *"Il Training Metacognitivo -Musico – Motorio" Aspetti teorici e pratici nel percorso abilitativo e didattico per DSA e BES.* Pensa Editore Lecce

 Cornoldi, C., (2023).*I Disturbi dell'apprendimento*, Il Mulino Editore

 Cornoldi, C., (2007). *Difficoltà e disturbi dell'apprendiment* Bologna, il Mulino,

Damasio A., (2008). *Emozioni e coscienza*, Adelphi Milano

Dalcroze E.J., (2009). *Il ritmo, la musica e l'educazione*, EDT, Torino,

De Beni, R., Moè, A., & Rizzato, R. (2003). Lo studio all'Università: caratteristiche e modalità di promozione. *Giornale italiano di psicologia*, *30*(2), 277-298.

Delalande F., (2004). *La musica è un gioco da bambini*, Franco Angeli, Milano

Dettori F., (2017). *Una scuola per tutti con la didattica per competenze*, Franco Angeli, Milano,

Kinard, J., & Kozulin, A. (2005). Rigorous mathematical thinking: Mediated learning and psychological tools. *Focus on Learning Problems in Mathematics*, 27 (3): 1-29,

Lucangeli D.,(2012). *Il cervello è matematico*, La Scuola, Brescia.

Martinet, S. (2008). *Esplorare il pensiero di Jaques Dalcroze*, Progetti Sonori,

Miles T.R. & Westcombe, J. (2008). *Musica e Dislessia, aprire nuove porte*; Rugginenti Editore,   Milano

Miles T.R., Westcombe,J., & Ditchfield, D. (2018). "*Musica e dislessia. Un approccio positivo*". Rugginenti Editore, Milano

Montessori M. (2022). *La Mente del bambino*. Edizioni Feltrinelli, Milano

Nicolson R., Fawcett A. J., & Dean P. (2011). "Dyslexia, development and cerebellum", *Trends* Neuroscienze, 24, 516-517.

Driscoll, J. (2024). *Orton-Gillingham Level One Practice Workbook. Approach to Phonics for Dyslexia.*

Piaget, J. (2016*). L'epistemologia genetica*, Ed. Studium, Roma,

Piaget, J. (2000). *Lo sviluppo mentale del bambino e altri studi di psicologia*. Einaudi, Torino

Portwood, M. (1996*) Developmental Dyspraxia. A Practical Manual for Parents and Professionals.* Durham: Durham County Council.

Proverbio A.M. (2019). *Neuroscienze cognitive della musica. Il cervello musicale tra arte e scienza*. Zanichelli, Bologna.

Rabaglietti E; Ciairano S; Gemelli F; Musella G, &Albanese O. (2009). Dalla Metacognizione alla

Metamotricità. *I Convegno Nazionale Apprendimento e aspetti relazionali nella scuola*.

Thelen,E. (1979).Rhythmical stereotypies in normal human infants, Animal Behaviour,27(3),699-715.

Vygotskij L., (1992). *Pensiero e linguaggio*, Laterza, Bari, 1992.

Zatorre, R.J. & Peretz, I. (2001). *The Biological Foundations of Music*, New York

Academy of Sciences.