Chapter # 6

BUTTERFLY-PIANO:
A playful learning proposal for children with Autism Spectrum Disorder

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ABSTRACT
This chapter discusses the importance of teachers' openness to new teaching methodologies and tools, especially in the context of inclusive music education for individuals with Autism Spectrum Disorder (ASD). In addition to the challenges arising from adaptive pedagogical practice, the chapter proposes a reflection on the use of the piano as an instrument that mediates learning and socialization. The present study aims to suggest new and creative possibilities for using the piano – considered one of the most traditional musical instruments – through the application of a non-conventional graphic element. The methodological proposal presented here, called Butterfly-Piano, involves not only a playful and diversified design, but also a therapeutic association between musical notes and colors, which can effectively complement treatments for this population. It is expected that this "new instrument," which can be made at home using cardboard, will provide children—especially nonverbal children and those with limited social interaction—with a better quality of life.

Keywords: Autism Spectrum Disorder, learning proposal, American methodology, group piano, butterfly-piano.

1. INTRODUCTION

It is no longer a novelty to state that a teacher must always be open to different conjectures and teaching methodologies. The world is constantly changing, and as part of a social context that is in constant motion, we must be increasingly receptive to new tools that help us positively transform the reality in which we are immersed.

Unlike in the past, due to the greater ease in diagnosing conditions such as Autism Spectrum Disorder, today we face the challenge of adapting ourselves and embracing – with humanity and generosity – an increasingly inclusive and welcoming teaching practice.

In the field of music education, didactic conceptions still reveal, in many contexts, a conservative character, with little sensitivity to the needs of students with specific potentials and limitations (Pereira, 2020). Although human beings present singularities, distinct competencies, and difficulties, all have the right to access musical knowledge.

Those educators who "master instrumental technique and everything related to their instrument, but who do not necessarily master the art of teaching, much less understand learning processes, cognition, and human behavior" (Louro, 2015, p. 39), are not in alignment with the truth that music is for everyone, as advocated by music educator Shinichi Suzuki, thus missing the opportunity to implement a truly transformative music education (Suzuki, 1993).

Such individuals also fail to grasp the premise that, as art and music educators, we can help change a person's life – since all of us, as human beings, are musical beings who have lived musical experiences and who can also be encouraged to achieve positive and meaningful experiences within the world of sound and silence, since music is a universal right and a powerful instrument for change in people's lives (UNESCO, 2019).

2. BACKGROUND

Increasingly, music has been used as a complementary resource in the care and support of people with ASD. Many individuals on the spectrum demonstrate a natural predisposition and identification with certain instruments, such as the piano, and this preference can be used as a bridge for social and communicative interaction. Recent studies indicate that musical and music therapy interventions are associated with improvements in communication, social interaction, and behavior in autistic children (Geretsegger et al., 2022; Ke et al., 2022).

Alvin and Warwick (1991, p. 13) point out in their studies that children who fall within the autism spectrum tend to have a greater ability to establish interactions and reciprocal relationships with objects than with other individuals. In the context of music, they may develop a more substantial familiarity with a particular instrument for several reasons, including its physical form, and this object can be used as a supportive means to help autistic individuals build a bridge of interaction between their inner world and the environment in which they are situated. These same authors report that, from a pedagogical perspective, the piano offers particular characteristics that make it suitable for musical interventions with autistic individuals and, consequently, as an object, it can act positively and significantly as a supportive instrument for communication.

As reported by Neves, Parizzi, Freire, & Nunes (2022, p. 4), "Ockelford (2018) emphasized that children with ASD and severe learning difficulties are frequently fascinated and motivated by music and may demonstrate instrumental ability on the piano. In 2009, this same author suggested that the piano is often the first instrument of choice for children with this disorder—particularly those with absolute pitch…". Furthermore, the authors highlight that the shape or design of the instrument allows children to engage in interactive experimentation with others (the foundation of group piano methodology).

Thus, the size and materiality of the piano promote interaction through shared attention activities. Another factor highlighted is that, because it has an organized system of keys, the instrument in itself offers a stimulus of interest to autistic individuals, who tend to have a natural affinity with organized series or patterns (Neves, Parizzi, Freire, & Nunes (2022).

As demonstrated in numerous studies, engaging with music—which involves not only sound but also silence—can be "the key to unlocking the door that may have kept the individual in silence" (Bauer, 2012).

Considering that ASD is frequently associated with various comorbidities such as anxiety, sensory processing disorders, motor difficulties, and deficits in socioemotional communication (APA, 2022), music can function as a relevant therapeutic and educational resource, optimizing the control and regulation of stress and anxiety (Anauate, 2025). However, its benefits are not limited to socioaffective dimensions. Recent evidence indicates that engagement with a musical instrument activates, develops, and stimulates the domains of motor skills, coordination, sensory processing, and cognition. Among these domains, fine and gross motor skills, motor coordination, sensory integration, and cognitive processes related to attention, memory, and planning stand out (Srinivasan et al., 2022; Wan & Schlaug, 2010).

Despite the challenges an autistic individual may face – considering not only the characteristics of the disorder itself but also the differences that shape human beings and make us unique in our capacities, potential, creativity, understanding of the world, and personal and artistic expression – we all occupy a sacred space in this earthly dimension. Nature, in its wisdom and perfection, has gifted many atypical individuals with a natural predisposition for absolute pitch. This means they have a developed internal ear capable of distinguishing one musical note from another without the aid of a reference instrument.

Another relevant dimension concerns auditory perception. Recent research indicates that individuals with ASD present differences in pitch perception and a higher prevalence of absolute pitch when compared to the general population (Wenhart, Altenmüller, & Kopiez, 2019; Ong et al., 2024; Romani et al., 2021; Dohn et al., 2012; Wenhart et al., 2019). Autistic individuals are approximately three times more likely to have absolute pitch than individuals considered typically developing, a fact observed in all the autistic individuals with whom we had the opportunity to work. Clearly, this characteristic can—and should—be taken into account so that autistic individuals can develop more effectively from multiple perspectives, achieving not only improvements in social and emotional skills, but also in abilities involving memory, attention, focus, sensory processing, and communication. However, the literature emphasizes individual variability, as not every individual with ASD possesses absolute pitch, and auditory abilities may vary widely. Issues related to sensory processing, as is well known, must be addressed with great sensitivity by the support team working with autistic individuals, since some are hyposensitive while others are hypersensitive. Many atypical individuals, for example, show aversion to high-volume sounds or to specific sound frequencies.

Thus, music presents itself as a comprehensive and potentially effective tool for enhancing quality of life and promoting the holistic development of individuals with ASD, especially in inclusive educational contexts.

2.1. Butterfly-Piano: A Creative and Inclusive Proposal

Considering all these factors as essential from a music educator's perspective – especially one seeking to offer autistic children an additional opportunity for recreation and stimulation through an adapted version of the group piano methodology – this article presents not only a new playful design proposal for the instrument, but also a practical functionality.

The proposal encompasses both a functional redesign of the instrument (facilitating reach, reducing unwanted auditory stimuli, and incorporating tactile markers) and adjustments to group dynamics (shared attention activities, predictable routines, and the use of visual and auditory references).

We know that creativity has always accompanied humankind. But it is often necessity that drives us to seek creative alternatives to meet certain needs. As a professor of group piano teaching methodology in the undergraduate music education program at the Federal University of Sergipe, in the northeastern region of Brazil, we face daily – within the university routine – an economic and social reality very different from that found in other Brazilian regions or more developed countries.

In general, in music degree programs in Brazil and the United States, regardless of whether students aim to become composers, conductors, or instrumentalists, non-pianist students are required to take piano courses. These classes support their studies in theory and structure and help improve ear training, since the piano is simultaneously percussive, harmonic, and melodic – in other words, complete.

Over fifteen years working in higher education with the group piano methodology (Logier, 1827), we have encountered a wide range of challenges. A significant portion of beginning students who entered the group piano lab during that time had special needs, in

addition to coming from socioeconomically disadvantaged backgrounds. While we had a program and schedule to follow during class, additional extra-class practice and dedication were essential for everyone to consolidate the material covered. Many students worked in various jobs during the day and attended our evening courses, commuting from rural towns without access to electricity or even running water. But how could they study piano or even acquire a small five-octave keyboard – sufficient for beginners – if they didn't even have access to basic sanitation or public health services?

Drawing inspiration from the silent pianos used by musical geniuses like Mozart and Beethoven during long carriage journeys on tour, we advised our students to build a small keyboard by drawing a few octaves onto a piece of cardboard. Instead of going to waste, that piece of cardboard was transformed into a true learning instrument.

Scientifically, it is known that "creative learning is an approach that transcends the mere assimilation of subjects and content, as it stimulates imagination, curiosity, and the ability to solve problems in original ways" (Tiburski, 2024). Alternative learning paths should always be sought by those who make education a vocation of the heart.

Naturally, building your own instrument and realizing that, by handling it, you can access a vast universe—through imagination or thought—makes the learning process more rewarding and pleasurable. The students do not see themselves as mere recipients of information, but rather as engaged and welcomed while building new knowledge and expanding their perception of the world.

The proposal of a soundless keyboard, inspired by the silent pianos of the past—which are still used today—offers the child the opportunity to work on cognitive interaction alongside finger dexterity. With this creative strategy, students are encouraged to develop their inner ear, since while imagining and attempting to trigger musical notes, as well as speaking or singing the sounds that make up a melody, they are optimizing the integration and progress of both cerebral hemispheres. Rhythm, in general, is controlled by the left side of the brain. However, speech and logical reasoning, once attributed solely to the left side, and image recognition and musical ability, once considered exclusive to the right side, are now proven to be functions of both hemispheres.

Therefore, the playful and silent piano proposed here will be highly useful in complementary and alternative therapies for individuals with autism, not only with the aim of helping them overcome their specific challenges, but also in fostering cerebral and cognitive interaction. It is worth remembering that Neves, Parizzi, Freire, & Nunes (2022, p. 3) advocate "the use of the piano… also as an exceptional tool for providing children with ASD a multisensory experience at the beginning of their musical development. In this context, the piano should also be used… percussively…".

In the case of the Butterfly Piano, since it would have no sound – only a keyboard with the names of the notes from segments of universal songs, associated with the principles of chromotherapy – it is expected that some form of verbal communication will be initiated by autistic children, supported by other therapies. We have several neurodivergent students who did not speak until the ages of 4–6 and who, through the continuous listening of songs in various languages, began oral communication through singing. Naturally, over time, children can be encouraged to interact with conventional keyboards or pianos, actually performing what they had imagined and expressed in some way through frequent contact with the playful instrument in question.

3. OBJECTIVES

The objective of this research is to suggest new creative possibilities for using the piano—considered one of the most traditional musical instruments—for individuals with Autism Spectrum Disorder, based on the group piano methodology, aiming to promote a better quality of life for children with ASD, especially those who are nonverbal and have limited social interaction, the latter being the main learning goal of piano through the group methodology.

4. METHODOLOGY

The research is grounded in a qualitative approach, structured through a bibliographic investigation guided by the analysis and adaptation of the constitutive principles of the group piano methodology. After the selection of the theoretical corpus, an analysis of the references was carried out in order to identify convergences, gaps, and potentials within the fields investigated.

The foundations of the group piano methodology were established by Logier (1827) and, over the years, were systematized by American pedagogues such as Calvin Cady and Raymond Burrows to promote musical literacy among beginner students of all age groups (Peare, n.d.). Group piano methods, regardless of whether they are designed for children or adult beginners, encourage creativity, improvisation, and ensemble interaction. Having had the opportunity to work with Piano 101 and Alfred's Group Piano for Adults, which serve as the basis for the configuration of the butterfly piano scores, we can state that there is no more stimulating method for introducing both adults and children to the instrument than group piano, as it is grounded in social collaboration.

Thus, the adopted methodology made it possible not only to systematize the state of the art related to the topic, but also to propose creative and theoretically grounded possibilities for the use of the butterfly piano as a pedagogical, creative, and inclusive resource.

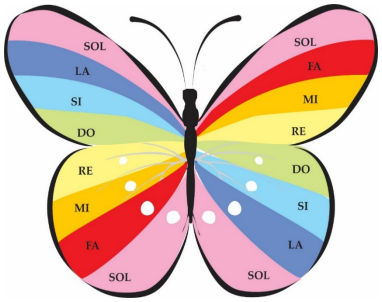
5. DESIGN

Regarding the design suggestion for the Butterfly Piano, which can be made of cardboard at home, it would be represented as follows.

Figure 1.
Butterfly-Piano design.

Butterfly-Piano of the support network member

Piano 2



Autist's Butterfly-Piano

Piano 1

Many autistic children have particular interests. However, the choice of a playful symbol also needed to involve the union of at least two parts so that the traditional group piano methodology could be incorporated. Thus, the Butterfly Piano would serve as an initial exploration tool between an autistic child and a partner, whether from their family circle or not.

Since the adapted sheet music is part of a song repertoire passed down from generation to generation and also reproduced by various media, it is believed that it will generate a certain level of identification, familiarity, and affection from the autistic child.

Although fingering suggestions are provided – based on what is traditionally used in piano practice – the main goal of the proposed work is that, while the autistic child explores the keyboard (since the hands are essential in the production of knowledge), the vocalization of the lyrics should be encouraged. The suggested songs should be listened to repeatedly through available media, as recommended by violinist Shinichi Suzuki in his method for beginning string students.

In piano playing, both the right and left hands have their fingers numbered from 1 to 5, starting from the thumb. What is written in the treble clef is read with the right hand, while what is written in the bass clef is read with the left. Naturally, the time set aside in the autistic child's routine for exploring the Butterfly Piano should always be accompanied by an adult in the role of Piano 2, who will not only "play" their part on the silent keyboard but also sing the melody of the song suggested in the sheet music. In general, the melody will always be found in the Piano 1 part. While the adult encourages the child to "play" the Piano 1 notes, they sing the melody so that the child can mentally associate sounds and words, reinforced by the tactile and sensory engagement of their hands.

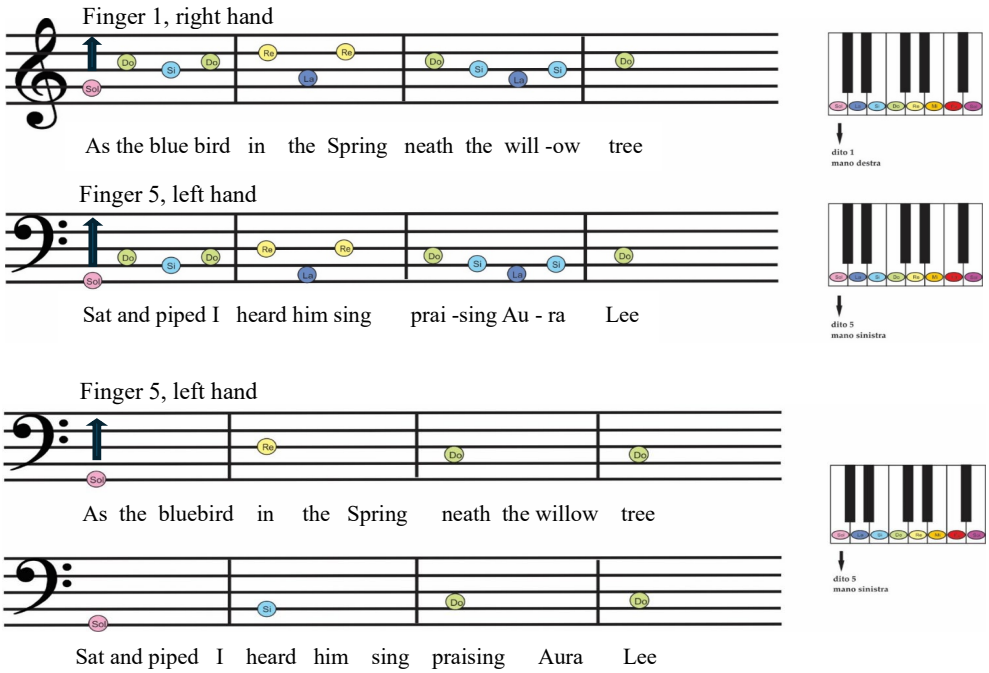
Music is divided into measures, each organizing what should be performed within that specific bar. Since these are universally known songs, the rhythm in the sheet music of these playful pianos does not follow formal notation. The colored notes in these arrangements occupy the same positions as those in a traditional score, but without the technical rhythmic symbols.

With repetition, it is expected that the autistic child, while listening to the song and mentally "playing" it on the silent keyboard, will gradually begin to verbalize the syllables of the lyrics along with the adult, which could significantly contribute to their oral expression and social interaction—the foundation of learning an instrument through the traditional group piano methodology.

The first suggested passage for exploration remains within the G major pentachord. The choice of pieces that work within pentachords is a highly effective strategy in beginner piano pedagogy, since only the first five notes—in this case, starting from G—are used to compose the musical phrase. This means the hand position remains fixed, with each finger resting on a specific note, making it easier for the student to understand the notes and their placement at this initial stage of study.

Considering chromotherapy, the G major pentachord would incorporate colors that, emotionally speaking, are generally significant for autistic individuals. While G, A, and B are associated with violet, indigo, and blue, C and D are associated with green and yellow. Another important aspect when teaching beginners is the choice of short pieces with longer note values, at a slower tempo. Both autistic and neurotypical individuals who are beginning musical literacy on the keyboard tend to struggle with long pieces, and at this early stage, the main goal is muscular, emotional, and physical relaxation.

Figure 2.
Aura-Lee – arranged by Priscila Gambary – Piano 1 and 2.

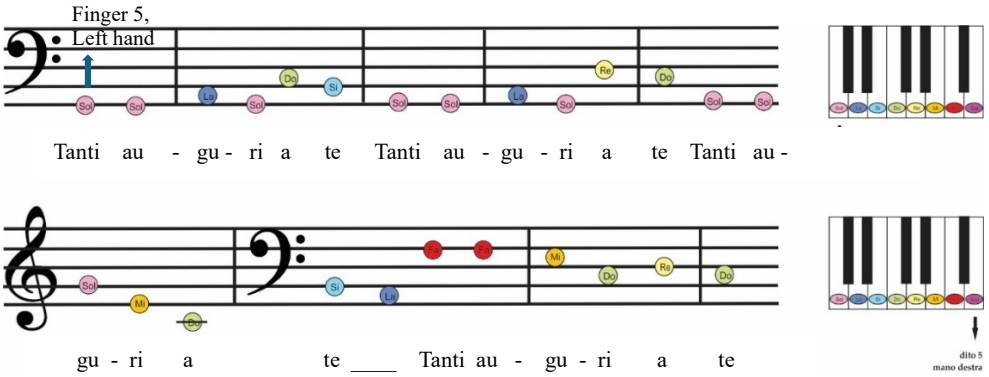


According to Rissato (2024), "bilingualism related to autism can enhance the ability to adapt to different situations… in addition to providing cognitive stimulation, improving communication… and fostering social and cultural inclusion…".

All the "works" listed here feature melodies that are universally recognized across various cultures. The languages adopted do not prevent the "performer" from translating them into their native language, although many begin vocalizing in different languages.

Figure 3.
Tanti auguri – Mildred Hill/ Patty Hill/ Arranged by Priscila Gambary.

Piano 1 (treble and bass clefs)



Piano 2 (bass clef)

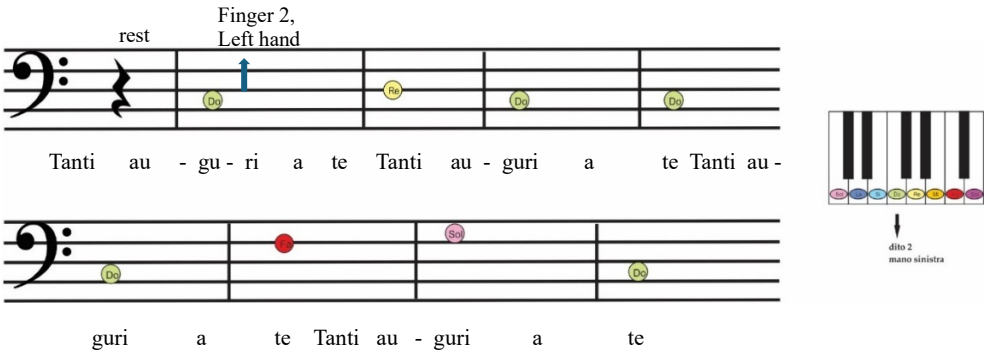
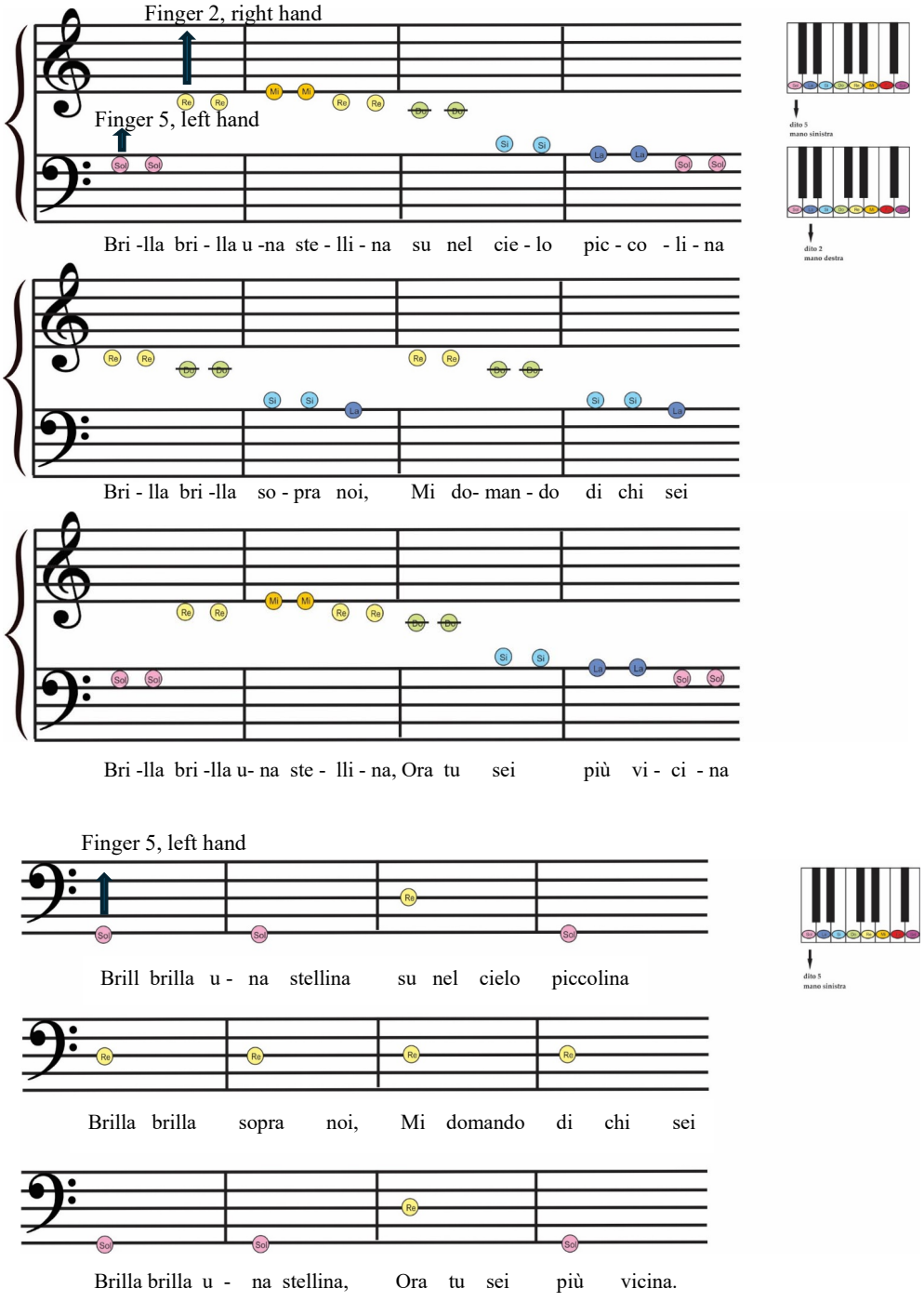


Figure 4.
Brilla, brilla una stellina – arranged by Priscila Gambary – Piano 1 e 2.



For many educators, affection is an essential component for the development of intelligence and for fostering the interest and motivation of any individual, whether neurodivergent or not (Wadsworth, 1997; Macedo, 2021).

If the person performing the Piano 2 part – written in the bass clef – is part of the autistic individual's network of affection, the expected results may be achieved faster than one might imagine. Suzuki argued that, within the scope of music pedagogy, children are educated primarily through example. According to him, the main teaching tool, in all its dimensions, is affection.

6. FUTURE RESEARCH DIRECTIONS

As previously mentioned, the foundation for the construction of these pianos is the group piano methodology (Logier, 1827). Therefore, the child would not unleash their imagination without the presence of an adult mediator—without the need for prior musical knowledge—who could be the father, mother, sibling, grandparents, therapists, or anyone within their support circle. This would contribute to strengthening even further the social and emotional bonds between individuals.

There is a technologically developed physical structure when we think of the traditional conception of the American group piano methodology. Each student occupies a digital piano, and we have seen teachers working with 22 students at the same time in a single class, with the help of an assistant. Just as a beginner learning to read and write needs their own materials, in the group piano methodology, the process is no different: each student must have their own textbook and a piano available to them. Regarding the textbook, it is worth noting that, for this methodology, there are several books written that do not work well for conservatory-style or individual piano lessons, and vice-versa, for example Piano 101 (Lancaster, Renfrow, 1999) and Alfred´s Group Piano for Adults (Lancaster, Renfrow, 1996). Group piano methods, in addition to repertoire, regardless of whether they were designed for children or adult beginners, stimulate creation, creativity, composition, improvisation, practice, and ensemble interaction. Having had the opportunity to work with both methodologies, we can say there is no more stimulating method for introducing adults and children to the instrument than group piano. There are methods created for use in music universities with students who do not have piano as their main instrument – who need contact with the instrument for complementary training – as well as methods for children, which encourage imagination and music-making in a playful way, with a slower, step-by-step approach, respecting the developmental stages of a specific age group and with attractive, colorful visual elements. Books designed for adult beginners, who wish to learn piano as a hobby or for leisure, present musical content and graphic design in a different way.

The author of this research began introducing teenagers, young adults, and seniors to piano in 2009 through a university Community outreach and social inclusion project at the Federal University of Bahia, as an assistant professor and doctoral student in piano. There were nearly 150 students distributed across 20 classes, with eight digital pianos available.

Naturally, extra-class study is necessary because it is through repetition that we expand our work memory and transform it into learning, consolidating new knowledge. In 2013, when we took over group piano classes at the Federal University of Sergipe, our physical structure was more modest, with keyboards of limited range—which are sufficient at the beginning. As already mentioned, students also had greater restrictions on extra-class practice. It was from this need for daily practice that we began providing cardboard pianos. We can say, without hesitation, that the students who adopted and embraced this strategy achieved the best results in the course.

It was with the intention of adapting this idea, along with the foundation of the group piano methodology, that the creation of the Butterfly Piano for autistic children emerged. The association of the instrument with a butterfly was not made by chance – symbols have always been essential to the process of human development.

It is known that, in general, autistic individuals have difficulty imitating what they hear or see (Kerches, 2019). For this reason, many are unable to begin verbal communication at the age when it is expected for a typical child to start babbling their first words. But even if the individual cannot express themselves verbally, everyone in their family and support network should continuously encourage dialogue. The fact that a child does not speak does not mean they do not listen. Some autistic children may not respond with words, but just as one can feel welcomed through a hug, a gesture, or a simple look, it is possible to attempt interaction or self-expression in response to external stimuli without the need for oral communication.

When we engage in the challenging process of self-awareness and self-acceptance, we are able to accept life as it is, and we are able to accept others as they are. When we understand that there is an infinite world of possibilities to be discovered within ourselves, we are able to see—and help others see—that they also possess this creative world that allows us to build, deconstruct, and reconstruct knowledge daily. When we speak of an atmosphere that involves play, there should not—or should never—exist a balance that tips between "right" and "wrong," because mistakes should always be seen as possibilities or pathways for development and learning, not for judgment.

Thus, as Vygotsky stated – cited by Rodrigues and Angotti (2023, p. 5) – symbols "are psychological instruments that represent the real world within our mental universe, expanding our ability to communicate what we understand."

The main goal is that the autistic child will, in their own time, be able to reproduce short phrases from popular songs, considering the predisposition many have toward absolute pitch, while exploring their silent keyboard. As chromotherapy has shown positive results not only in complementary treatments for autistic individuals but also for neurotypical ones, we believe that this suggested relationship between colors and musical notes can be effective.

"Those with absolute pitch can identify musical pitches without needing to compare them to an external reference. This means they have an internal memory for exact pitches" (Sacks, 2007, p. 90). It is also important to note, according to the same author, that those with absolute pitch often have high abilities and may associate sounds with colors.

Regardless of whether we think of an autistic or non-autistic individual, the fact is that colors – like sounds – can evoke sensations and emotions that do not have the same meaning for everyone, as each of us has a personal life repertoire and history that changes according to our experiences. However, some colors and sound textures generally evoke specific feelings in human beings. For example, "the color blue is associated with joy and with influencing verbalization in people. In autism, blue stimulates feelings of calm and greater balance… Orange and yellow, being very close in the spectrum, can help in the social stimulation of children" (Brites, 2025).

The understanding of colors and their gradients is taught in the various therapies that a neurodivergent child should have access to after diagnosis and determination of the necessary level of support. Therefore, the objective here would be to reinforce or complement what is already being worked on by their support network. It is known that chromotherapy may not work for everyone, but it has produced good results in many neurodivergent individuals. What matters most is that everyone can develop their creativity, as long as they are encouraged and inspired to live life with curiosity.

Among the various definitions of creativity, we highlight that of Ghiselin (1952, p. 21): "Creativity is the process of change, of development, of evolution in the organization of subjective life. Without questioning, without experimentation, observation, and an interest in seeking connections, we cannot keep the flame of creativity alive. And it is through it that we are able to build a life of purpose and fulfillment."

We must not forget that the brain that thinks and processes information is also a repository of emotions. According to Comoli (2021), "when an experience is strong enough to consolidate information, a process begins to form synapses and neural circuits that did not exist before, and the brain changes physically. Because of the physical emotions of memories, there is no single brain identical to another – the memory gives us identity. And creating identity – or rather, contributing so that each individual builds and lives their own – is what should truly drive us as mediators of content and knowledge."

7. CONCLUSION

Based on the premise of the group piano methodology – which is grounded in collaboration, positive reinforcement, interaction, and the creation of a genuine support network that makes learning as engaging and human as possible – we present this new proposal for creating playful pianos adapted to the needs of autistic individuals. These pianos, whose notes are associated with the principles of chromotherapy, produce no sound, respecting an important aspect when considering the sensory experience of the spectrum; they are inspired by silent pianos.

Before speaking of welcoming and inclusion, the first thing we must understand is that diversity is what makes life more interesting and richer to experience and live.

Contrary to today's world, in the traditional group piano methodology there is no room for competition with others, but rather for fostering a sense of solidarity and affection. We conclude this proposal – focused on embracing diverse individuals – by affirming that it is possible to create a learning environment and an exchange of experiences that are more sensitive and cooperative if we truly understand that being different is what is normal. And that, for the other to be well, we must be well with ourselves so that, together, we can find a way to resonate beauty, love, and compassion into the world.

Contemporary music education demands an ethical, empathetic, and creative teaching approach. The Butterfly-Piano proposal therefore seeks to bring piano teaching closer to an inclusive perspective, one that is sensitive to the cognitive, emotional, and sensory needs of children with ASD. Beyond fostering musical development, it is also essential to contribute to the creation of experiences that reinforce everyone's right to music.

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