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Motor skills and Neuromotricity. Theoretical-practical justification through the BAPNE method
Habilidades motrices y neuromotricidad. Justificación teórico-práctica a través del método BAPNE

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Abstract. In this publication we present a theoretical review in which neuromotricity has clear links with motor skills through the activities of the Bapne method. Neuromotricity provides numerous resources related to body schema, physical condition, kinematic analysis where executive functions and especially the dual task are always present. The aim of this article is to propose activities and resources, addressed to physical education and music education teachers in an interdisciplinary way, to work on displacements, jumps, turns, throws and receptions.
Key words: BAPNE, Motor skills, neuromotricity, displacements, jumps, turns, throws and catches.

Resumen. En esta publicación presentamos una revisión teórica en el que la neuromotricidad posee claros vínculos con las habilidades motrices a través de las actividades del método Bapne. La neuromotricidad aporta numerosos recursos vinculados al esquema corporal, condición física, análisis cinemático donde las funciones ejecutivas y en especial, la doble tarea, están siempre presentes. El objetivo de este artículo es proponer actividades y recursos dirigidos a los docentes de educación física y educación musical, de manera interdisciplinar, para trabajar desplazamientos, saltos, giros, lanzamientos y recepciones.
Palabras clave: BAPNE, Habilidades motrices, neuromotricidad, desplazamientos, saltos, giros, lanzamientos y recepciones.

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Introduction

Motor skills contribute positively to children's physical, cognitive and social development. (Lubans et al., 2010). From the point of view of the PRISMA method, we observe that in the last ten years, consulting the Web of Science database, 37,493 documents have been written on this subject, of which 27,358 are scientific articles and 2,898 are review articles. Most of the publications are within the disciplines of Psychology and Behavioral Sciences. The journals that have published the most on this subject are Plos One, Frontiers in Psychology and Journal of Sports Sciences mainly. The most representative authors are Y. Wan from Soochow University - China and Lisa M. Barnett from the University of Sydney with numerous articles on intervention with control and experimental groups as well as on fundamentals.

After the analysis of all the bibliography it is deduced that no one has linked motor skills to neuromotricity, this article being a first approach through the BAPNE method.

Neuromotricity is a discipline with increasing publications that provide a clear difference from motor and psychomotor skills (Andreu-Cabrera & Romero-Naranjo, 2021). In the field of physical activity and sport sciences it provides numerous resources for both body schema work and physical condition and kinematic analysis (Alonso-Marco & Romero-Naranjo, 2022; Romero-Naranjo & Andreu-Cabrera & Arnau-Mollá, 2023; Romero-Naranjo & Andreu-Cabrera, 2023a, 2023b, 2023c, 2023d). Academic body percussion seen for possible work on cognitive and executive functions provides high-impact publications in Web of Science that evidence possible improvements in the attentional network (Álvarez-Morales & Romero-Naranjo, 2019; Romero-Naranjo & Pujalte-Cantó & Arnau-Mollá, 2023) and executive functions (Castelló-Juan et al., 2019; Torró-Biosca et al, 2019).

It is important to note that there is research in secondary school (Fabra-Brell & Romero-Naranjo, 2017; Latre-Navas et al., 2019; Piqueres-Juan et al., 2019; Romero-Naranjo & Sayago et al., 2022), as well as for students in music conservatories (Moral-Bofill et al., 2020; Ros-Silla et al., 2019) and in the elderly (González et al., 2019), among others. Regarding the visual arts there is also research (Alonso-Sanz & Romero-Naranjo, 2015), as well as in the learning of a foreign language (Fernández et al, 2021), the study of dances with body percussion in other cultures (Di Russo & Romero-Naranjo, 2021a, 2021b, 2023; Romero-Naranjo, 2008; 2013b) as well as for the creation and contribution of practical resources from an ethnomusicological perspective (González-Sánchez et al., 2021; Romero-Naranjo, 2012; 2013a; 2020c, 2020e, 2022a, 2022b; Romero-Naranjo & González, 2022a, 2022b; Romero-Naranjo & Sayago-Martínez, 2021a, 2021b; Sayago-Martínez et al., 2021). Similarly, we cannot forget the contributions made in the field of musical language (Romero-Naranjo, 2013a, 2013b, 2013c, 2014, 2016, 2017, 2017, 2018, 2019, 2020, 2021, 2022).

Body expression has an important role within the contents of the sciences of physical activity and sport, in which motor skills are a highly valuable resource. For this reason, the aim of this article is to carry out a theoretical review on motor skills while providing practical resources related to body expression in the field of neuromotricity.

The main objectives of this research are focused on:

- What are the motor skills and what is their basis?
- What are the motor skills linked to neuromotricity?

The importance of movement and its relationship with the brain

One way to increase brain neurotrophins is to make the brain work to produce greater amounts of these substances. That is, the more active the brain cells are, the more neurotrophins they will produce, and this will generate, in

turn, greater connections between the different areas of the brain. The consequence will be a better functioning brain, a better memory, and a better mood (Insua, 2003). Most daily activities consist of a series of routines that make the brain function automatically, with a minimum of wear and tear, for which it requires a minimum of energy. In other words, routine activities are unconscious, experiences pass through the same neuronal pathways already formed and there is no production of neurotrophins. The brain should be made to "run" with new and different actions.

Reading activates all regions of the cerebral cortex (Insua, 2003). On the other hand, physical activity is one of the effective resources to increase neurotrophin levels. In fact, it has emerged as a modulator of higher mental functions during life, as it has been shown to affect several neurotransmitter systems. Specifically, brain-derived neurotrophic factor (BDNF) is a key mediator in the use-dependent enhancement of synaptic connections and the brain's ability to change and remodel these connections (plasticity).

In experiments carried out with rats (Tuszynski, 1994) it was observed that after several days of voluntary running in a wheel, at least 1-2 km per day, the levels of BDNF increased in the cells of the hippocampus, a highly plastic structure, which is normally associated with higher cognitive functions, rather than motor activity. Changes in neurotrophic factor levels appeared in a few days, both in male and female rats, and were sustained over time, after several weeks of exercise, with a consequent increase in the amounts of BDNF protein. In addition to increased levels of BDNF being found in the hippocampus, they were also found in the lumbar spinal cord, cerebellum, and cortex. On the other hand, a positive correlation was found between the average distance run per day and the increase in BDNF in the hippocampus.

Research conducted in humans suggests that exercise can maintain or improve brain plasticity. Learning, a higher function that requires high plasticity, increases the expression of the BDNF gene, and this, in turn, facilitates learning.

These evidences predict that mechanisms that induce BDNF gene expression, such as exercise, can improve learning. Many studies have analyzed the influence of aerobic exercise on the increase or decrease of BDNF with different protocols regarding the type of exercise: chronic aerobic exercise, resistance exercises or acute aerobic exercise, duration, and intensity.

A neuromotor program that develops global motor skills, with a wide variety of activities and with execution times appropriate to the age of the child, will cause changes at the brain level, specifically in terms of neuronal plasticity. This will have a positive impact on the cognitive functions of the practitioners.

We understand global or gross motor to the movements of large and general muscle groups (which involve the entirety of our body). These moves require more power than precision, as might be the case with scrolling.

Balance and coordination in basic motor skills

The vestibular system regulates the sense of movement and balance, it is what allows us to place our body in space, movements, and our environment. Balance is the state by which the body maintains a stable posture counteracting the action of gravity.

Three systems cooperate in maintaining balance:

-Inner ear system or vestibular system.

-Visual system.

-Propioceptors: receptors distributed throughout the body and that report the

position of joints, muscles, etc.

The vestibular system is contained within the inner ear and is made up of:

- Vestibule: Inside the vestibule there are two structures, Utricle and Saculus. In the utricle and saccule there is a receptor organ called the macula, which is made up of ciliated sensory receptor cells. They are covered by a horizontal membrane. On this membrane there are a series of Calcium Carbonate crystals that are called otoliths and are very susceptible to changes in gravity.

- Semicircular ducts: there are three and are oriented in the three planes of space. They have a dilation in their lower part called "Ampulla", inside which is an organ of balance, which is called ampullary crest. The ampullary crest is composed of ciliated sensory receptor cells, which are covered by a dome-shaped gelatinous membrane. These cells rest on other connective cells and are connected to the neurons that start the nerve that will carry the information to the interior of the brain.

It is one of the first sensory systems to develop during the prenatal phase and comes into function from birth. It is also one of the vastest sensory systems in the human body. The purpose of the vestibular system is to stabilize the visual scene during movement and/or movements of the head and/or body. The vestibular system, having the receptors located in the inner ear, allows by its activity on the eye to keep a stable image on the retina. This gaze stability is key to balance.

In addition, the vestibular system allows the anticipated orientation of the gaze. A look oriented in the direction of our displacement before the rest of the body is oriented.

The development of balance is an important competence in the motor maturation process of a child, especially for walking. Most of us live our entire lives without realizing that we have a "sixth sense": the sense of balance, also called the vestibular sense. When it functions normally, it seems banal to be able to walk upright or simply stand stable. Among the problems caused by a defective vestibular system are: clumsiness, coordination of difficult movements, poor evolution of distances, nausea... Any anomaly of the vestibular system disturbs the normal functioning of a person.

It seems that the movements are rotating, the swings, the turns provide great vestibular stimulation to the brain, thus helping it to organize itself better by treating sensory information, contributing to balance. Therapists treat

children with vestibular dysfunction with seesaws, skates, swings, etc.

There are different types of vestibular stimulation:

A. Jumping, rebounding activities (sitting, kneeling, or standing)

B. Rocking activities (knees, sitting, lying face down or face up…)

C. Slides

D. Jumps and bounces on cushions.

Vestibular stimulation leads us to familiar motor experiences such as modifications of spatial positions, rhythmic swings, rotations. The vestibular system controls muscle tone and antigravity musculature. It helps us to coordinate the muscles of the eyes with those of the head and also the following actions:

- Postural reactions of trunk and head extension.

- Maintenance of the permanent erect posture of the body by activation of muscle tone.

- Maintenance of balance after changes in the position of the head in space.

- Bilateral coordination of both parts of the body: both in symmetrical movements, for example, when clapping; as in alternating movements.

Along with the proprioceptive and visual systems, it helps us maintain our balance.

On the other hand, in terms of coordination, it should be noted that it is an essential motor variable in all physical activity and can be defined as the ability to perform movements efficiently, accurately, quickly and in an orderly manner. In other words, coordination is what allows us to move synchronously all the muscles involved in an action to perform it in the most adapted way possible. Although motor skills and movement involve a large number of frontal brain areas, the main structure responsible for coordination is the cerebellum. Poor coordination can prevent us from living our day to day normally. It is not uncommon for coordination to be one of the capacities that deteriorates the most with aging, making activities of daily living difficult. Fortunately, coordination can be trained through cognitive stimulation.

We distinguish between general dynamic coordination and segmental coordination. The types are:

- Motor coordination: Motor coordination refers to the coordination of the different muscles of the body based on what we perceive from all our senses. It refers to all coordination as a whole. It is mainly related to gross motor skills and includes the two types we see below.

- Hand-eye coordination: It is also known as visual-motor coordination and hand-eye coordination. It refers to the ability to manipulate our hands based on what we perceive with our eyes. It is the type of coordination that fine motor skills require.

- Oculo-pedic coordination: This refers to the ability to manage the feet based on what we perceive with our eyes. It would also be characteristic of gross motor skills.

Age groups and basic motor skills

From the field of Evolutionary Psychology, three fundamental periods are distinguished:

Early childhood. From 3 to 6 years old. Children begin to interact with each other and improve motor skills and strength, increase self-control and begin to be more independent and have more egocentric behavior.

Middle childhood. From 6 to 12 years old. Children begin to think logically, and egocentrism decreases, language and memory develop. It is the moment in which self-esteem is created and physical growth begins to slow down.

Adolescence. From 12 to 20 years old. It is a stage in which very rapid and significant physical changes occur. The search for an identity begins.

For the neuromotor program that we present, three age groups have been proposed referring to the childhood period, depending on the evolutionary characteristics and motor development. These groups consider the different internal processes of growth and maturation, as well as chronological age. For this reason, the criteria for grouping children has taken into account possible individual differences, ensuring a minimum motor potential to reach the higher level and carry out the proposed activities.

Specifically, the following age groups are proposed: 4-6 years, 7-9 years, 10-12 years.

Group 4-6 years

This is a very rich stage in the acquisition of psychomotor skills. The word "psychomotor" implies two closely related dimensions: the development of human motor skills cannot occur outside of human ties, although neither can it occur without the growth of bones and muscles. The body in the young child is a vehicle and a privileged medium for the expression of his/her emotions and state of mind. He learns to control his body and increases his ability to govern it. This phase has been called the "age of grace" because of the exquisite ease, spontaneity, and grace of children's movements. The child easily imitates others and accompanies their gestures with words; expresses his feelings without any inhibition. It is an age of motor and sensory exuberance.

As they acquire greater physical skills, they become more confident in themselves. There are pleasant situations that the child discovers while learning to govern his or her body. Among others is the pleasure of pushing, the pleasure of rotation, the pleasure of conquering height, the pleasure of walking and running… So that all these acquisitions can be given and consolidated, it is a priority that parents respect the child's rhythm. There is no need to force it or rush it. However, we should not deny the difficulties if they exist. At four years old he can jump "on one leg" and carry a cup of liquid without spilling anything; He can dress and undress himself, even if it takes him a long time, and he begins to perform small services at home.

At 5 years old he continues to gain ease, agility, and speed. They like to climb, run, dance, jump, skip, and swing. Most have already acquired good control of their body and enjoy exercising their skills. They purposely engage in increasingly difficult things, such as climbing higher

and higher trees and balancing on higher and higher walls, to increase the excitement. The pleasure they feel when being in high places can be interpreted as feeling big, reaching the height of adults, and even surpassing it. At this age the child discovers the real existence of other peers, thus leaving the family limits. If until now the relationship was one of "parallel play", with very momentary and sporadic relationships, we will see that from the age of 4 changes emerge in the child's attitude towards other children. They explain to each other what they are going to do as a way of "taking into account the presence of the other." However, rivalries appear when they carry out community activities. Even collaboration is very precarious, since the child attributes his/her own desires to the other and interprets what the other expresses also from his/her point of view, which always causes conflicts. And the fact is that, in the childhood stage, the human being is egocentric. Being egocentric is a way of understanding the world through one's own point of view, without understanding other points of view. The ability to put ourselves in the place of others, to understand and accept them, making them respect us, develops in childhood.

Play is an activity for the child, in addition to being pleasant, necessary for his/her intellectual, affective, emotional, and relational development. Spontaneous play promotes maturation and creative thinking. The child displays his childish omnipotence quite exuberantly in games. The younger a child is, the greater their illusion of being the center of the world. He believes he is as powerful and has as many abilities as he sees parents, teachers, in short, those who care for him.

Between 5 and 6 years old, some hints of collaboration appear; Companions begin to be considered and begin to be able to play with each other, a capacity that will then develop greatly over the following years. In their games, children play with ideas that are important to them, they play to explore their inner world as well as the outside world, they play to dominate their emotions.

By playing they learn to get along with each other, they discover what it will feel like to be another person, they begin to learn to appreciate the virtues of giving and taking. The games of children at this age tell us a lot about their interests, their ideas, their state of development. Parents, teachers, and anyone interested in children of this age will find that they get to know a lot about children just by watching them play. At this age, playing is a way of life. Children bring the events of daily life to their games along with the stories and stories they have heard. When playing, the child places himself on the edge between the internal and the external, between fantasy and reality.

The five-year-old child strives to find the difference between what is imagination and what is reality. However, he lives trapped in both worlds at the same time, that of reality and that of fantasy, and passes quickly and, it seems, with complete ease from one to the other to those two "realities." On the one hand, he behaves in a perfectly normal way. On the other hand, he still lives in a magical world. Things have life, both the objects we call inanimate and true living beings. Or better yet: it is the child who makes the objects live. At 5 years old, the child has not yet reached the stage of playing organized games in which rules must be followed, such as soccer or rescue. It is at a slightly older age when they start playing those games. At 5 years old, they prefer role-playing games, often inspired by their TV shows such as Batman, Superman.... Other games will be variations of "moms and dads" or "schools." It will be a little later, when the children are already capable of sacrificing a part of their own desire to conform to the group's desire, when they will begin to enjoy organized group games or team games.

At this age of 5 children are still in the process of improving their motor skills and are fully engaged in physical activity.

By the time they are 6 years old, they will have acquired all their motor skills. Girls become interested in activities that include finer movements than boys, such as skipping and dancing.

The neuromotor objective at this stage is to promote the development of the body schema by working on perceptual-coordinative abilities, basic motor skills, and sociomotor behaviors. The basic physical qualities are not worked on specifically.

Group 7-9 years

According to Piaget (1970), the stage of concrete operations begins. This stage occurs between approximately seven and twelve years of age and is marked by a gradual decline in egocentric thinking and the increasing ability to focus on more than one aspect of a stimulus. As for physical development, from this moment on, children no longer experience those "growth spurts" in terms of height and weight typical of the previous stage and will develop at a more regular pace. At this stage, both boys and girls will invest most of their energy in carrying out two activities that are fundamental for their development: play and school learning. As in the previous one, also at this stage of development, recreational activity, play, continues to be "the fundamental activity of children."

The game offers the possibility of expanding both physical and intellectual capacities. Both their activity with the body and the games vary according to age. Around the age of 7, activities with the legs predominate: running, playing ball, skating, jumping... where the most important thing is strength. Around the age of 8, they begin to coordinate harmonious movements, using ingenuity and skill, although strength still counts. Although children share games, there are differences in the form and actions that characterize them. Girls are more likely to enjoy movement, boys with speed and strength. Games serve not only as a release of energy, but also as a lesson in group functioning, with the challenges that it entails, learning to endure rivalry, learning mastery and bodily integration, and tolerance between one another. It is important, following the proverb that says "everything that is learned in a fun way... is never

forgotten" to allow children to enjoy their childhood through play.

As this stage progresses, the boy and girl are able to control their impulsiveness, they can stop the action, and this increases their ability to think and discover themselves. Reflection and imagination are enhanced.

At some moments he wants to be older and at other times his behavior would correspond more to that of a baby. It presents emotional lability, and the transition from love to hate occurs in a matter of seconds. As the stage progresses, the child opens to a world of obligations and duties that he/she will have to learn to fulfill and respect. He will try to strike a balance between his desires and prohibitions.

The relationship with peers varies as the child grows. Until the age of nine, the relationship is not individual, but rather the need of the group is based on carrying out its activities and its own affirmation. It is around nine when the group takes on other characteristics; becomes more homogeneous and stable. At this age, selection according to sex is also considered. At the end of this stage, respect for others and honesty appear. The child begins to initiate cooperation and shows solidarity with the rest of the members of the group.

The neuromotor objective at this stage is to continue promoting the development of the body schema by working on perceptual-coordinative abilities, basic motor skills and sociomotor behaviors. The basic physical qualities are not worked on specifically either.

Group 10-12 years

At 10 years old, the child appears complacent and serene. About Los 11 his personality becomes more and more established. He becomes more curious, talkative, investigative, and restless. They can recognize themselves as being weak in sports, good at playing a musical instrument, at making friends and being considerate of others.

They become more self-critical and usually evaluate themselves by comparing their abilities and achievements with those of others. They tend to feel more responsible for their limitations. Between the ages of ten and twelve, the child protests if he is treated like a child and feels that he has grown enough to feel bigger, stronger, and more responsible than what is understood as a child.

To the extent that the eleven, twelve-year-old child values, esteems and considers himself capable and competent, there will be more hope for adequate psychological, mental and social maturation and for a happy human being capable of making others happy.

At the age of 10, the child is moving from childhood to pre-adolescence almost imperceptibly for parents and educators. It is the golden age of evolutionary balance, of the child, who is serene, frank, familiar and affectionate with his loved ones. In general, they are calmer and more self-confident than before and less fearful. Almost all of their problems and difficulties are reduced to school: homework, excessive tasks, etc., which cause anxiety. At 11 years old, it is as if an uncontrollable and unknown force takes over them. He can be, at times, spiteful, unpleasant, and insolent.

He makes jokes all the time, growls and gets upset at practically everything. Starting in pre-adolescence, instability and sudden changes occur. For example, when bonding with the opposite sex, difficulties normally arise when establishing friendships. As part of their sociosexual behavior, preadolescents must learn the socially correct things to do and say in social gatherings.

In some students there will be a consolidation of the achieved motor balance and others will begin the characteristic processes of puberty that materialize in morphological changes resulting from hormonal activity: Growth, increase in muscle, rounding of the figure, first signs of hair.

In terms of motor skills, boys are practically the same in their physical abilities, except for the greater strength that boys have in the forearm and the greater general flexibility that girls have.

What there is a difference is in the appearance of anatomical and physiological changes, which begin to appear at the end of the stage. The evolutionary rhythm means that girls begin to take the "growth spurt" at 11 years old and it extends until 13-14. Breast enlargement also begins around the age of 11, as well as the first signs of the appearance of pubic hair. In boys, however, the "growth spurt" will not take place until the age of 13, as will the increase in penis size. The testicles and the appearance of pubic hair will take place around the age of 12.

The neuromotor objective in this stage is to work on basic and generic motor skills and sociomotor behaviors. The pre-sports game is worked on, within a wide range of recreational activities. The basic physical qualities are not worked on specifically.

The playful act and neuromotor skills

The playful act has been interpreted in recent times from the praxiological current under the prism of the "Science of Physical Activity". Lanuza E. et al. (1980) state that games encourage:

- general dynamic coordination in those games in which it is necessary to run, jump, walk quickly, slowly…
- postural control in those in which balance participates
- the inhibition of movements in which control of the body's activity is required
- visual-manual coordination when there are throwing movements directed towards some point, as in cutting games, for example.
- fine finger movements in skill games
- respiratory behavior in blowing games
- spatial orientation in those games that refer to the spatial notions up-down, right-left, in front, behind, above, below…
- rhythm in all those in which singing, recitation, and the adaptation of movement to rhythmic sequences are involved
- Knowledge of the game involves, on the one hand, mastering its structure, that is, the sequences in which it

develops, and, on the other hand, adjusting the child's activity to a specific time and space to carry out the game. .

Play is an essential activity for development and maturation, not only in the perceptual and motor areas, but also in the cognitive, affective, and social development capacities. From the point of view of motor development, recreational activities provide a more harmonious development, not only because they promote the development of gross and fine motor skills, the coordination of precise movements, balance, rhythm, etc., but also because They help the child integrate into the group ("run with others", follow instructions, follow rules, etc.).

Likewise, it states that sensory and perceptual development is notably facilitated by games in which the child operates in a spatiotemporal framework with varied objects; Thus, it discovers colors, shapes, fragility, and resistance, exercises the exploratory spirit, develops spatial and temporal notions (many games are based on rhythm, alternations, waiting...), etc.... A large part of sensory acquisitions and notions linked to the sensitive, which the child possesses at the end of childhood, have led to play.

Definition of basic motor skills

Phylogenetically, there are some patterns of basic motor behaviors, such as running or jumping, which are susceptible to be modified, even complicated when adapting to sport specificity. These are basic skills that can be categorized according to the areas where they develop, which allows us to clearly differentiate the functions of: Locomotion, Manipulation and Stability. It distinguishes two categories of basic movements, movements that involve locomotion (walking, running, jumping) and movements that do not involve locomotion (bending, stretching, twisting, turning, pushing, pulling, swinging, and swerving). In brief, they are rolling - crawling - crawling - crawling - sliding - sliding - sitting - walking - standing - running - braking - galloping - climbing - descending - climbing - climbing - suspension - swinging - traction - grasping - throwing - dodging - pushing - catching - passing - jumping - kicking, ...

Displacements

(Walks, races, quadrupeds, crawls, climb up...)

It is any progression from one point to another in space using total or partial body movement as a means. The following aspects stand out: The setting in action, the changes of direction, the speed of execution, the duration of execution (distance of the displacement) and the stops. From a functional playful point of view, we can distinguish the following purposes in displacements: Reaching the target point, reaching the target point in a span, reaching the target point at a precise time, reaching the target point before other individuals, reaching farther than other individuals, dodging, escaping, etc. from other individuals.

Jumps

The jump implies a take-off from the ground because of a violent extension of one or both legs. The body is momentarily suspended in the air, and it is precisely in these brief instants that the jump fulfills its function, saving an obstacle, performing a throw or reception from this advantageous position or, simply, maintaining a rhythmic scheme.

The phases of jumping are impulse, flight and fall and from the functional point of view, jumping can be considered according to the following aspects: overcoming obstacles, in height, in length, combined, reaching an object out of our direct reach, throwing an object over an obstacle, maintaining a rhythmic scheme by means of successive jumps.

Turns

These are all movements involving rotation through the ideal axes that traverse the human being, i.e., the vertical, the anteroposterior and the transverse. Movements around the longitudinal axis will produce longitudinal rotations, e.g., turning around in the air and falling back down. Movements around the anteroposterior axis will produce lateral rotations, e.g., the side wheel. Movements around the transverse axis will produce forward and backward twists, e.g., cartwheels. Spinning, as well as jumping and moving, develops neuro-muscular coordination and movement control, and the ability to orientate with respect to visual references. In addition, the turns favor the development of the ability of spatial and temporal perception.

Launches and receptions

Throwing implies a previous cognitive process from which the concept of "getting there without going there" is developed. The objective of throwing is to have an impact on the environment by means of an impact with an object. The ludic character that can be given to the acquisition of this type of skills arises when posing situations in which the object to throw and catch enters in dispute between several people or groups. This category includes, among others, the actions of throwing, hitting, and catching (with and without implement, upper and lower body, right and left...).

In parallel, we speak of generic motor skills as techniques or patterns for one or several skills, which are present in many sports.

These are:

- Bounce: Union of the throw and adaptation of the mobile.
- Hitting: Violent or abrupt encounter of one moving body with another.
- Driving: Carrying a mobile from one side to another without loss of control.
- Feint: Stopping the previous displacement to make a change of direction of the mobile, the individual or both to deceive the opponent.
- Interception: Divert or cut the trajectory of a mobile or an individual before it reaches its destination.

Specific motor skills would be those corresponding to the specific technique of a sport.

Motor skills in BAPNE

The BAPNE method provides numerous practical theoretical resources, as well as quantitative neuromotor-based studies (Alonso-Marco & Romero-Naranjo, 2022; Álvarez-Morales & Romero-Naranjo, 2019; Andreu-Cabrera & Romero-Naranjo, 2021; Arnau-Mollá & Romero-Naranjo, 2022a, 2022b; Di Russo & Romero-Naranjo, 2023; Romero-Naranjo, 2013a, 2013b; 2016, 2020, 2022; Romero-Naranjo & Sayago-Martínez, 2021; Romero-Naranjo & Andreu-Cabrera & Arnau-Mollá, 2023; Romero-Naranjo & Pujalte-Cantó & Arnau-Mollá, 2023; Romero-Naranjo & Llorca-Garnero, 2023; Romero-Naranjo & Andreu-Cabrera, 2023a, 2023b, 2023c, 2023d, 2023e). Several bibliometric studies have been carried out on this subject that quantitatively show the most representative authors on this topic (Arnau-Mollá & Romero-Naranjo, 2022a, 2022b, 2023) (Table 1).

Table 1.
Classification of the five paradigms of the Dual Task (Romero-Naranjo & Andreu-Cabrera, 2023)

	Dual Task Paradigms
1	Motor/Motor. These are two tasks that possess a motor component (Amboni et al., 2012; Beurskens & Bock, 2013; Hung et al., 2013; Lee et al., 2017; Shim et al., 2016). They are classified into two major blocks: A. Balancing tasks: we observe this in the hospitality world when we see a waiter carrying a tray, several plates in his hands or a simple glass of water. B. Oculo-manual tasks: an example is walking forward while fastening the buttons of a shirt.
2	Cognitive/Cognitive. These are two activities with a cognitive component (Baddeley & Hitch, 1974; Corlu et al., 2015, Wang & Gathercole 2013). A practical example is writing the alphabet on a piece of paper while answering cognitive tasks such as the capital of Germany, the opposite of white, tell me the result of 2x9, translate the word "chair" into English, etc.
3	Cognitive/Motor. It consists of performing one task with a cognitive component and another with a motor component (Bridenbaugh & Kressig, 2015; Crockett et al., 2017; Falbo et al., 2016; Fok et al., 2011; Hawkins et al., 2018; Lin & Lin, 2016). There are many variables of activities because the literature on it is abundant. The voice has a fundamental role since the person must speak continuously according to the verbal fluency tasks that are indicated. There are many variants and here we show a few of them: A. Walking and arithmetic tasks (addition, multiplication, division…). B. Walking and working memory (remembering words from a story…). C. Walking and verbal fluency (counting backwards the days of the week). D. Walking and semantic fluency (saying words beginning with "N"). E. Walking and categorical fluency (say only fruits or musical instruments…).
4	Rhythmic/Motor. It consists of performing a rhythmic and a motor task (Park et al., 2014; Kim et al, 2017). A practical example is walking forward while playing a percussion instrument following a rhythmic pattern. The same can be executed by performing a rhythmic structure with clapping.
5	Rhythmic/Motor/Cognitive (Romero-Naranjo et al, 2023a). It consists of performing a task with a motor component linked to movement, another with a cognitive component and another with a rhythmic component. The BAPNE method provides many practical variants where the novelty lies in the fact that the subject must not only speak but also sing, recite, hum, etc. For this, the methodology not only uses the body, but it is supported by hoops of different sizes, feathers, strings, chopsticks, cones, maces and other objects. The neuromotor table (Figure 4) helps the initial activities. The activities are classified into three major groups: A. Dual-task activities walking freely in space. B. Bipedal dual-task activities with geometric figures (figure 8). C. Seated dual-task activities. Each of these activities has the task of moving the lower limbs completely independently of the upper limbs while performing verbal, rhythmic or melodic fluency tasks.

It is important to highlight that the double task is articulated through five paradigms that have been supported by several authors (Table 2) and that have produced abundant literature (Mas-Mas & Arnau-Mollá & Romero-Naranjo, 2023; Romero-Naranjo & Andreu-Cabrera, 2023c, 2023d) (Table 3).

Table 2.
Table of authors with the highest academic production on neuromotricity.

Most prolific authors in Neuromotricity	
Francisco Javier Romero-Naranjo	28
Antonio Francisco Arnau-Mollá	15
Roberto Sayago-Martínez	7
Eliseo Andreu-Cabrera	4
Luisamer González de Benatuil	4

Motor skills can be worked on in the BAPNE method with very specific activities structured by thematic modules detailed below.

A. Displacements in BAPNE.

In relation to movement, there are numerous music-motor activities from a neuromotor perspective that allow various types of movement. Not only the work in facing rows, free movement or especially the work in circles or concentric circles in BAPNE that involves displacements and turns both to the right and to the left that are previously indicated by the teacher. These indications force the students to react to the displacement indicated by the teacher so that they can never predict the direction in which they should move. Numerous activities with the name "With the A", Greetings I-II-II, Campanero, Obwisanga… use displacements in facing rows or concentric circles and with these characteristics. (Figure 1).

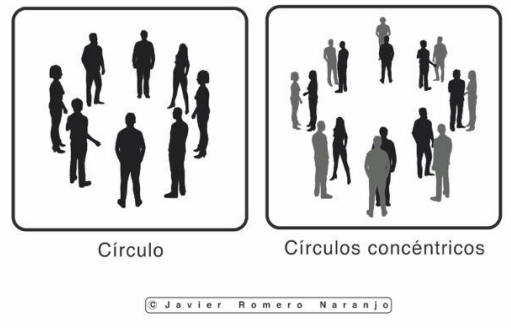
Documents by research group

Research group	Docs.	Cit.	Colaboration						Intervention with acts. B.P						Gender participation	
			O.M	Cit.	O.W	Cit.	Mix	Cit.	Int.	Cit.	No int.	Cit.	Prot.	Cit.	M.P	F.P
BAPNE	161	1232	91	783			70	449	18	214	135	928	8	90	267	145
Secondary engines	118	682	76	513			42	169	3	7	114	675	1		185	93
1r Orden	118	682	76	513			42	169	3	7	114	675	1		185	93
Primary engines	43	550	15	270			28	280	15	207	21	253	7	90	82	52
1r Orden	43	550	15	270			28	280	15	207	21	253	7	90	82	52
No BAPNE	84	333	29	125	34	116	21	92	24	99	59	227	1	7	61	67
Secondary engines	55	167	21	103	22	31	12	33	17	57	37	103	1	7	38	39
1r Orden	22	36	10	19	8	13	4	4	7	10	14	19	1	7	17	15
2º Orden	33	131	11	84	14	18	8	29	10	47	23	84			21	24
Primary engines	29	166	8	22	12	85	9	59	7	42	22	124			23	28
1r Orden	8	42	3	12	2	2	3	28	4	15	4	27			8	9
2º Orden	21	124	5	10	10	83	6	31	3	27	18	97			15	19
TOTAL	245	1565	120	908	34	116	91	541	42	313	194	1155	9	97	328	212
Secondary engines	173	849	97	616	22	31	54	202	20	64	151	778	2	7	223	132
1r Orden	140	718	86	532	8	13	46	173	10	17	128	694	2	7	202	108
2º Orden	33	131	11	84	14	18	8	29	10	47	23	84			21	24
Primary engines	72	716	23	292	12	85	37	339	22	249	43	377	7	90	105	80
1r Orden	51	592	18	282	2	2	31	308	19	222	25	280	7	90	90	61
2º Orden	21	124	5	10	10	83	6	31	3	27	18	97			15	19

Figure 1. Bibliometric table of publications on body percussion worldwide (Arnau – Mollá & Romero-Naranjo, 2024).

"Con la A". Deconstructed coordination game for children

This proposal is born from a deconstructed children's coordination game with the aim of working on movements in concentric circles. The original clapping game "With the A" is focused on the work of laterality with the upper limb



and only to be worked in pairs. (Figure 2).

Figure 2. Learning models in circles and concentric circles.

On the other hand, in this article we propose concentric circle work for both the upper and lower extremities, which is why it can be worked on a wide range of people. (Figure 3).

- Concentric circles.
- Collaborative group work 30 people.
- Movement to the right, left or inner or outer circle as indicated by the teacher.
- Execution of the activity with the lower limb.

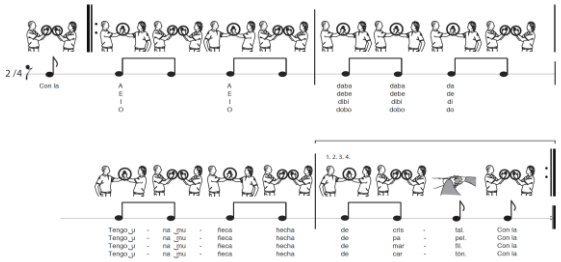


Figure 3. Sample of the clapping game "Con la A" in pairs.

Displacements with turns

Working in rows facing each other is very positive since it allows group interaction through musical-motor activities. Not only walking, but also turning and attending to displacements in space. Next, we place a model with a melody of African origin. (Figure 4).

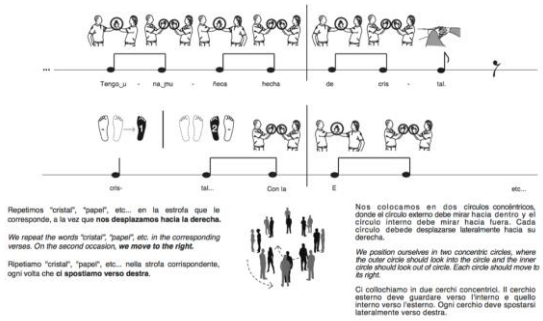


Figure 4. Explicación de la actividad con desplazamiento "Con la A" según el método BAPNE.

B. Reception

The Handsball Change technique focuses on the praxias working the double task that can be executed in multiple ways. It is important to note that these activities are never performed with pre-recorded music because the students must speak in parallel to the motor execution and know how to keep the tempo.

Reception. Handsball Change – 1.

The first activity is performed in pairs facing each other while the performers count from 1 to 4. The second sequence is executed by moving the feet alternately and then in a square (Figure 5).

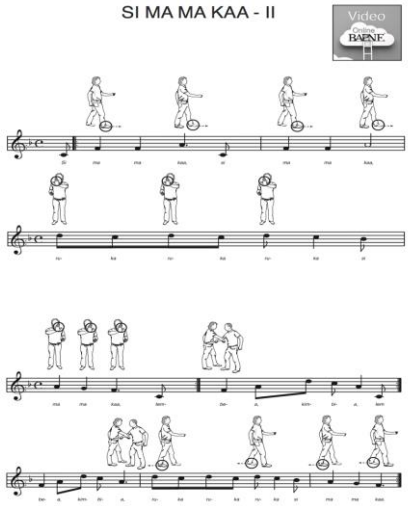


Figure 5. Explanation of "Si mama Kaa" activity according to the BAPNE method.

Reception. Handsball Change – 2.

The second activity is carried out in a group of 4 people where everyone must count from 1 to 4. The first pair always counts from 1 and the second pair counts from 3. (Figure 6).

Figure 6. Sample of ball reception in a dual-task pair.

Reception Handsball Change – 3.

The third activity is performed in a circle while all players move their feet in a square. The balls are passed to the right according to the numbers indicated by the teacher. (Figure 7).

Figure 7. Sample of ball reception with two pairs with double task.

Reception Handsball Change – 4.

The fourth activity is performed on a "Bosu" with the objective of knowing how to maintain balance while in pairs they pass the ball always counting aloud from one to four. (Figure 8).

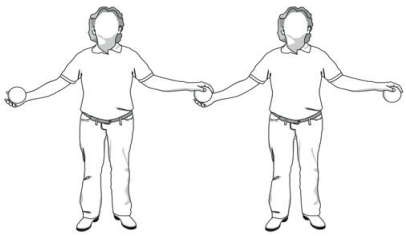


Figure 8. Sample of ball reception with people in a circle.

Figure 9. Sample of ball reception on a Bosu to work on balance.

C. Jumps

Throughout the methodology we use jumping specifically in numerous activities where body percussion is of great help.

Greetings I

In this activity we propose to work in concentric circles with different types of displacements (Figure 9).

- Concentric circles.
- Collaborative group work 30 people.
- Displacement to the right or left as indicated by the teacher.
- Displacement by means of jumps.
- Displacement towards the opposite circle.

Displacement and Creativity. Cognitive Solfege

The BAPNE method has an exclusive musical-motor learning program that uses strings and hoops to learn musical figures and even the pitches of notes with displacements (Romero-Naranjo, 2020).

Feathers and sticks

Musical-motor activities allow the use of elements placed on the floor in a row, such as sticks and feathers (Figure 10) (Figure 11).

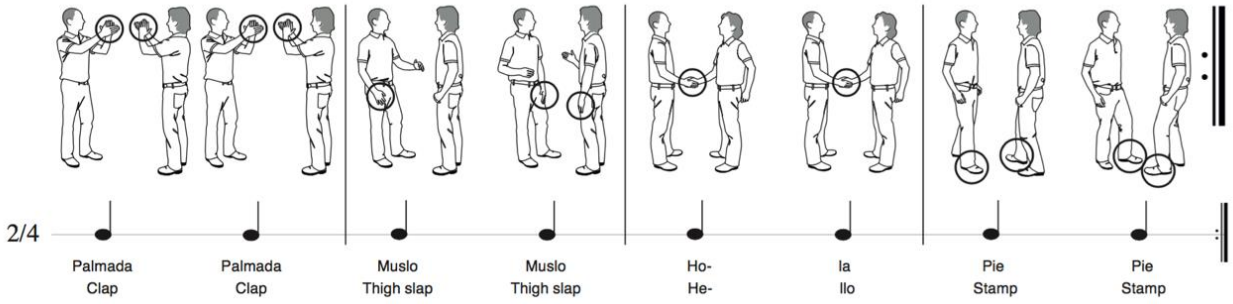


Figure 10. Sample activity of Salutation I to be worked in concentric circles.

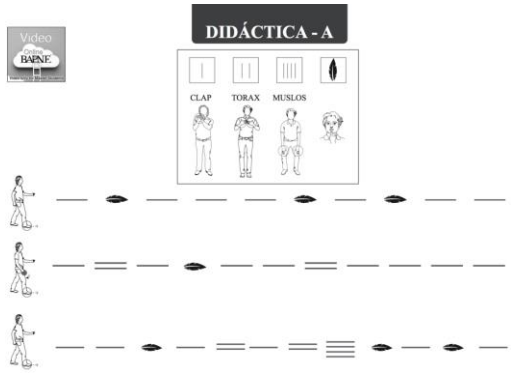


Figure 11. Displacement sample with ropes and feathers - A.

Hoops and ropes

The displacements can also be done with hoops and strings to learn the name and pitch of the notes (Romero-Naranjo, 2020). (Figure 12) (Figure 13).

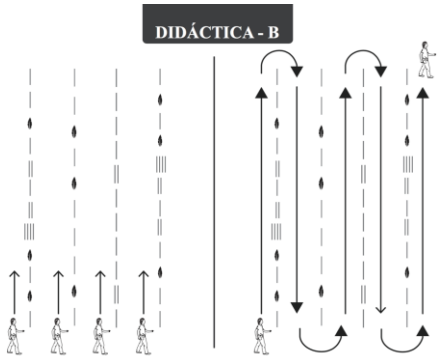


Figure 12. Displacement sample with ropes and feathers - B.

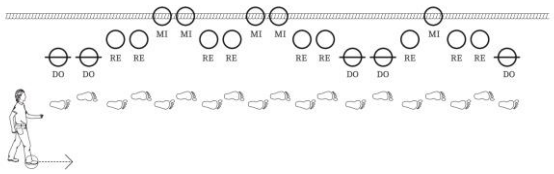


Figure 13. Sample displacement with rope and hoops for learning musical notes in BAPNE.

Conclusions

Motor skills can be worked from neuromotor skills through the BAPNE method due to the wealth of activities it presents. In previous articles on kinematic analysis (Alonso-Marco & Romero-Naranjo, 2022), body schema and physical condition (Romero-Naranjo & Andreu-Cabrera, 2022, 2023) we provided information that offers resources for its practical inclusion in the sciences of physical activity and sport. (Figure 14).

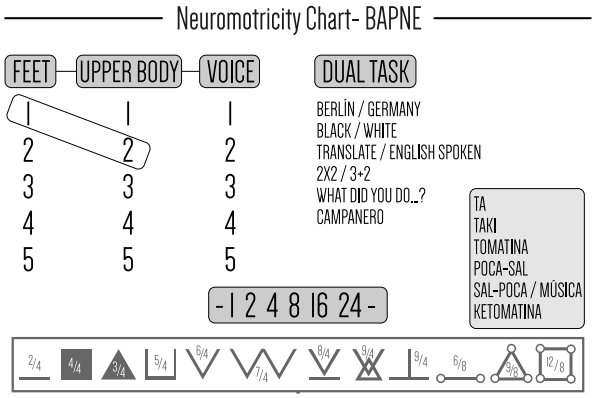


Figure 14. Neuromotricity Chart.

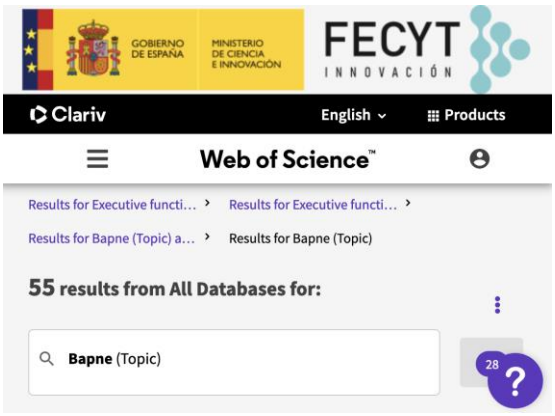


Figure 15. Bapne in Web of Science

Regarding motor skills, the BAPNE method provides many resources in the field of body expression with a perspective outside the classical parameters of psychomotor skills. The BAPNE method brings a completely new vision of practical resources based on motor skills because it has a clear focus on the dual task within the executive functions. This point is extremely important, because the dual task linked to language has never been addressed in practical motor and psychomotor resources. For this reason, students not only work on a series of activities from a mechanical point of view, but also increasingly it is proven that they work on cognitive flexibility, inhibition, planning, decision making, working memory through the double task in the activities of the Bapne method. (Figure 15).

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