

A biopsychosocial approach to plan inclusive learning environments in physical education

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Abstract:

In light of the new scientific awareness of motor learning and the new regulatory scenarios regarding inclusion, this contribution aims to highlight the potential of framing the teaching of motor activities according to a biopsychosocial approach. To this end, the study focuses on several key points, common to the non-linear pedagogy approach and inclusive didactics, that are considered capable of fostering the active and personalized participation of all (in quantitative and qualitative terms). This fostering helps to pursue a broadening of experience and an improvement in motor skills starting from personal and social autonomies, that are transferable and generalizable to different life contexts. In order to offer a theoretical framework capable of providing food for thought, interpretation, and analysis of the problem-situations emerging in the complexity of teaching practices, this study uses a theoretical-argumentative approach to promote the framing of motor activity within a holistic perspective, in which in the recognition of the dynamics of interdependence individual/environment, central both in terms of inclusion and learning processes, suggests the need to overcome the reductionism inherent in a traditional approach and to recognize the potential of an integrated approach that takes into account the complexity underlying motor learning processes, in particular. Such an approach helps to draw attention to the need to use the complementarity of the dynamic- ecological approach and the biopsychosocial perspective of the ICF to analyze and subsequently remodel inclusive teaching. The principles of the non-linear approach, placed in relation to the biopsychosocial approach, open new perspectives for teacher training by fostering the development of specific skills that can promote motor learning, life skills and inclusion.

Keywords: Physical activity, non-linear pedagogy, dynamic ecological approach, inclusion

Introduction

The complexity of today's educational scenario entrusts schools with the arduous task of coping with the complexity arising from perennially evolving socio-economic and cultural frameworks and, at the same time, to promote, for all pupils, the development of the same coping skills to respond to the emergencies of everyday life. The relentless evolution of legislation concerning special educational needs, the profound transformations that have taken place with regard to inclusion, the significant social and cultural changes due to the immersive and pervasive use of technological devices that are influencing considerations for the generation of 'post-millennials' (Iavarone, 2022) and, not least, the recently outlined post-pandemic scenario seem to entrust the educational institution with a fundamental and indispensable role in continuing to promote active participation in all life contexts, formal and informal, for each pupil. Also, in the light of the new awareness emerging from the introduction of the International Classification of Functioning (WHO, 2001; 2007), the paradigmatic axis around which the issues of inclusion and disability revolve has profoundly changed. In this new perspective, disability is no longer understood as the expression of individual characteristics of the subject, as envisaged by the medical model, but rather represents the result of a complex interaction between individual characteristics and the contextual variables that interact with them as facilitators or barriers (WHO, 2001; 2007).

This upheaval of the inclusive paradigm determines the move away from educational teaching practices oriented towards the adaptation of activities, to promote the integration of the individual within pre-determined learning processes, equal for all, but rather requires the adoption of practices that give back to the subject the power of action and choice, an expression of his or her peculiar characteristics and intentions. At this point, it is evident how necessary it is for schools and research to ask themselves in depth about which didactic strategies and techniques are, more than others, effective in promoting inclusive educational interventions, capable of encouraging the active and effective participation of pupils in meaningful and motivating experiences, in which they can manipulate, experiment and develop their own experiences.

Since time immemorial, physical education has played a leading role in promoting authentic processes of active participation for the child/young person, in which play experiences are particularly effective in promoting the acquisition of knowledge and skills useful in facing everyday challenges, making the most of all opportunities (UNESCO, 2015).

Moreover, the school represents an elective context, also in the promotion of physical activity, not only accessible, but also sustainable “physical activity should aim at the continuity of the practices, instead of selecting athletes by excluding those who are less talented” (Borgogni & Agosti, 2021, p. 577). The reflection on talents opens the debate on what should be pursued in the field of physical education teaching at school, designed and implemented for all; according to an individualized and personalized approach that considers individual characteristics and contextual ones.

However, the concrete reality does not always respond effectively to what is desired. As studies have shown, it is not enough to “be together”; in play practices, on the other hand, it is crucial to design and implement activities in which each learner can be “[...] the protagonist of his or her own learning” (Magnanini, 2021, p. 118). In discussing effective and inclusive teaching styles, it is necessary to support “the transition from a course in which the teacher expresses the highest degree of responsibility and decision in the choice of activities and executive and organizational methods (reproduction styles), to an approach in which, on the contrary, motor decisions and responses mainly concern the pupil and the group (production styles)” (Colella & D’Arando, 2021, p. 510). The consideration of differences can and must lead to designs and interventions that are able to respond in an individualized and personalized manner to the different needs and personalities of each pupil. “Differences - in fact - can create inequalities if institutional subjects are indifferent to differences. This is why the choices of educational models must be screened so that they do not create indifference to differences, taking them into consideration only when problems arise” (Canevaro, 2013, p. 184).

With reference to this complex yet inescapable perspective, some studies investigating the inclusive dimension of physical education in schools (Magnanini, 2021) report perceptions of ineffectiveness on the part of physical education teachers who, although positively oriented towards promotion, do not feel sufficiently trained and prepared to respond to the special educational needs of individual pupils (Hodge et al., 2004; Fiorucci, 2019). In order for theorizations and hopes to be translated into concrete and tangible realities, leading to a real impact on the possibilities of pupils’ involvement and development, it is essential that motor activities are truly constituted as educational tools capable of guaranteeing the inclusion of each and every one, starting from the valorization of the differences and potential of individuals.

This repositioning is fundamental to understanding the essential elements of reflection that must underlie strategies and practices, from the design phase to implementation, in order to enable physical education to fulfil this function. Up to this point, it has already emerged how much the concepts of “activity and participation” (WHO, 2001; 2007) are common elements to the two areas, the motor and the inclusive, which assume as an essential and perfectly overlapping principle, the recognition of the complexity underlying both motor learning processes and inclusive processes.

In light of the new scientific awareness of motor learning and the new regulatory scenarios regarding inclusion, this contribution aims to highlight the potential of framing the teaching of motor activities according to a biopsychosocial approach. To this end, the study focuses on several key points, common to the non-linear pedagogy approach and inclusive didactics, that are considered capable of fostering the active and personalized participation of all (in quantitative and qualitative terms). This fostering helps to pursue a broadening of experience and an improvement in motor skills starting from personal and social autonomies, that are transferable and generalizable to different life contexts.

Methods

The contribution starts from some reflections on the potential of motor and sports education, highlighting both the possible spin-offs in terms of inclusion that leverage on the real involvement and participation that effective didactic planning can foster, and those that can generate processes of exclusion, marginalization and isolation.

In order to offer a theoretical framework capable of providing food for thought, interpretation, and analysis of the problem-situations emerging in the complexity of teaching practices, this study uses a theoretical-argumentative approach. Such an approach helps to draw attention to the need to use the complementarity of the dynamic- ecological approach and the biopsychosocial perspective of the ICF to analyze and subsequently remodel inclusive teaching.

The idea is to identify the common epistemological and applicative elements in order to promote a more effective combination and declination in the school educational context, with the intention of initiating a systematization of certain indispensable principles for flexible and responsible didactic planning by teachers. Starting from the non-linearity that characterizes the teaching-learning process to adequately respond to the co-evolutionary individual-environment dynamics, some key points will be developed for the implementation of quality inclusive didactics by declining the principles of non-linear pedagogy in terms of didactic spin-offs.

Results

Participation vs exclusion: teaching as a contextual facilitator

In light of the scientific literature, physical education and motor-sport activities have always been considered tools for promoting integral personality development (Bailey, 2006), which is declined in terms of cognitive (Klein & Hollingshead 2015; Vazou et al. 2019), emotional and socio-relational skills (Danish et al.,

1993; Fraser-Thomas et al, 2005; Gould & Carson, 2008); of moral and character development (Bredemeier & Shields, 1986; Miller et al., 1997, cited in Marchetti et al., 2016); of promoting prosocial attitudes (Brunelle et al, 2007); perceptions of self-efficacy (Pesce et al., 2016) and self-esteem (Smoll et al., 1993); levels of attention (Gallotta et al., 2015) that are positively reflected in their success (Pereira, 2017; Průžek et al., 2020).

It appears, already at this point, evident how much the motor sport and inclusive practices, declined in the school educational context, share a horizon of common sense, oriented to the promotion of the principles of health, self-determination and bio-psycho-social well-being (WHO, 2016). Unlike formal and non-formal sporting contexts, the school, as a compulsory educational institution and therefore accessible to all, is constituted as an elective setting (WHO, 1994) entrusted with a dissemination potential of movement practices and bodily education, which is not as attainable and widespread in other contexts.

The school PE teacher is therefore entrusted with an essential training and dissemination responsibility for physical education practices that can foster the highest and best possible participation of all children (UNESCO, 2015).

As already anticipated, this function is far from obvious and easy to implement. As anticipated, studies highlight how participation in play or motor sport practices alone is not enough for the multiple positive effects just described to be realized (Petitpas et al., 2005; Marchetti et al., 2016; D'Anna et al., 2019). For the active participation of all to be pursued and fostered, the design of motor activities must be oriented towards the principles of individualization and personalization (Ministerial Decree 27/12/12) and the implementation of practices must take into account the elements of co-evolution and complexity that characterize the dynamics of individual/environment interaction (Varela et al., 197; Caruana & Borghi, 2016).

Improperly designed environments risk reinforcing or even giving rise to situations of non-participation that, in ICF terms, would inevitably generate inferences about the child's "non-functioning", raising further barriers to the inclusion process.

The negative effects of an inadequately proposed motor practice (because it is designed without due consideration of all the components that favor participation in activities: biological, cognitive, emotional and social) can be multiple and reflected not only on an individual level (of distancing or exclusion of the child) with important outcomes of perceived self-perceived ineffectiveness, but can extend to determine significant effects also on the collectivity, generating situations in which differences are highlighted, with discriminatory consequences (Secli & Ceciliani, 2014; Secli, 2016).

A motor activity proposed with a prescriptive teaching style with a focus on the outcome of the performance, or even simply structured in a univocal and linear manner (only one material, only one objective, only one path, only one outcome) could, for example, impede the possibility of participation of some children who, with or without difficulties, are not or do not feel able to tackle the prescribed task. One thinks of how much this, especially in the motor sphere where "non-participation" is more evident, can "highlight" differences by connoting them with a negative meaning, of ineffectiveness, in contrast to what the inclusive paradigm invites one to consider regarding diversity as an interpersonal resource.

Moreover, it would seem immediate and unfortunately not sufficiently taken into consideration that while it is true that motor-sports activities positively influence the development of life skills by involving, in play, all the dimensions of being, the opposite is equally true: the failure or inadequate functioning in play activities can generate negative repercussions on the acquisition of the same skills and, consequently, on constructs of self-efficacy and self-esteem (Pesce et al., 2016). The motor-sports activities, if not duly declined in an inclusive perspective in accordance with the principles of individualization and personalization, risk leading to the exclusion and therefore the lack of integration of the subject from educational practices and thus inevitably negatively affect the structuring of a positive self-image.

Considering what has just been described, it is opportune to highlight how crucial it is, on the part of the teacher, to assume a conscious didactic action. Only by starting from the application of skills for designing learning environments defined in relation to the facilitators and barriers and the strengths and weaknesses of each pupil, will it be possible to have a significant impact on the quality of participation and learning, with considerable repercussions on both the individual pupil and the class group.

The ecological-dynamic approach to respond to the co-evolutionary dynamics of the individual/environment

In reflecting on motor activities in the school context, studies, continuing what has been stressed in the psycho-pedagogical literature of the 1970s, highlight the benefits deriving from participation in play practices, which prove to be true transformative tools in children's lives, capable of promoting, for them, the development of capacities to cope with the complexity and stress factors of everyday life, also positively affecting their learning abilities (Ginsburg, 2007).

In light of contributions from the different fields of knowledge, from philosophy to psychology, from pedagogy to neuroscience, learning processes take on characteristics of complexity, in which the interdependence between the individual and the environment, which behave as complex dynamic systems (Kugler et al., 1982), in which in the reciprocal co-evolution the former significantly influences the dynamics of re-determination of the latter and vice versa, plays a decisive role (D'Anna et al., 2021). In other words, an individual's individual characteristics, experiences, prior knowledge and skills in the process of exploring and

interacting 'in and with' the environment are capable of determining profound changes in it and being modified by it in turn, in the simultaneous processes of perception and action.

In this perspective, the affordances present in the context take on great importance, directly and simultaneously influencing and orienting experiences (Gibson, 1979) and, the latter, conveyed and experienced "by" and "through" the body take on the function of mediating the simultaneous activation of processes of cognition, perception and action in sports practices, in which there is a continuous and intertwined relationship between decision-making processes and action (Davids et al., 2013; Correia et al., 2018).

At this point, the elements of overlap between this perspective, applied to studies on learning processes in general, motor, and the paradigm of inclusion in ICF terms, are already immediately intuited. The bio-psycho-social model promoted by the international classification describes disability, not as an ontological factor specific to the subject and, therefore, framed on a 'white background' that is irrelevant with respect to the possibilities of interaction and functioning, but rather as the result of the interaction between personal factors and the characteristics of the environment in which they live (WHO, 2001; 2007). The new theoretical framework common to the two fields, motor and inclusive, calls for a profound renewal of approaches within the teaching-learning processes, especially in the field of physical education, in which the bodily component is central par excellence.

Therefore, new reflections are emerging that need to be translated into good practice, on the theme of physical education and, more generally, of movement and the body, which fully exploit the potential of appropriately designed motor-sports interventions, according to non-linear logic, which, in full recognition of the complexity underlying the formal and informal contexts of life in which the child grows up and interacts, aim to respond effectively to the special educational needs of the younger generations, multiplying the possibilities of designing activities, and redistributing the facilities between the individual and the environment.

It is clear how much the assumption of this perspective, together with the hypotheses and intervention strategies, also multiplies the complexity underlying the effective implementation of motor-sport activities (Coppola & Papa, 2015) that imply the simultaneous and synergic involvement of different dimensions of being. This holistic view of motor activities, placed in relation to the integrated approach to the person promoted by the introduction of the ICF (WHO, 2001; 2007), allows motor-sport activities to be framed within a bio-psycho-social perspective and suggests the need to overcome the reductionism deriving from a traditional approach, which through educational interventions of an instructive type, repetitive of the correct execution of movement, is often 'exclusive' and which, certainly on its own, is not sufficient to recognize and meet the special needs, expressive and decisive potential of all children and to nurture their cognitive and motivational dimensions at the same time. By framing, therefore, the theme of participation transversally with respect to the suggestions deriving from the bio-psycho-social perspective and from the studies on the simultaneity of perception/perception/cognition processes, we intend to reflect on the design elements of learning settings that, while respecting individual variability, are able to "direct" the development of new skills and competences, effectively responding to individual needs and enhancing the personal characteristics of each child.

The individualized and personalized declination of educational practices will, in this sense, be better able to nurture, for all, the motivation to participate, through the enhancement of positive experiences for each child (Colella et al. 2008) and thus favor their real involvement in fun experiences (Carraro et al., 2008; Carraro et al., 2012) and participation in meaningful movement experiences (Whitehead, 2013, cit. in Rudd et al., 2021). It is essential to recognize the richness of a multidimensional approach, which considers the overall functioning of the individual in interaction with the environment (Rudd et al., 2021), in play practices in terms of activity and participation in relation to a duly and flexibly organized context (WHO, 2001; 2007). Consider how, unlike what is suggested by the traditional literature on motor learning, the principles underlying the Nonlinear Pedagogy approach (Chow, 2013) and the manipulation of constraints (Newell, 1986; Davids et al., 2008) are framed in direct continuity with the principles underlying psychomotor practice, which has always been considered, in the specificity of the Italian educational and clinical/rehabilitation context, an effective tool for promoting the child's integral development.

Psychomotor practice suggests, in fact, the need to structure a setting that favors the child's free exploration of space and a spontaneous and intentional motor investment that is self-organizing, according to the physical and social affordances characterizing the context and its individual characteristics (Palumbo, 2021). Similarly, the ICF perspective, in relation to the issues of disability and functioning, recommends the importance of structuring an environmental and social context that is facilitating and able to increase the possibilities of activity and participation of the subject, starting from and according to his individual characteristics, discouraging the promotion of a direct intervention on the individual.

In the motor domain, authors suggest the design of representative learning environments (Correia et al., 2018) and emphasize how this requires a deep understanding of the information that, duly arranged in the environment, directs motor investment and performance (Chow et al., 2020).

From this perspective, affordances constitute themselves as extremely effective individualization and personalization tools in fostering the development of adaptive functions and goal-oriented functional movements, as well as the acquisition of new motor skills that will be structured in ever-changing movement

experiences, starting from the affordance's dual function: the first one that is inherent to it and the second one that is determined in the "encounter" with different individuals.

The declination of the principles deriving from the dynamic ecological approach (Araújo et al. 2017; Davids et al. 2012), and the reflection on the repercussions of this implementation effectively responds to the need to identify, in motor-sports practices, keys to interpreting processes and more inclusive strategies. In this framework, preventive of exclusion and enhancing the possibilities of participation, "Learners should be guided to use perception and action to achieve a task goal, by interacting with relevant affordances of objects, surfaces, events, terrains, features and significant others during performance" (Correia et al., 2018, p. 118).

In this way, each child will have the opportunity to acquire new functional movement and motor skills, starting from personal initiatives and using different materials and tools, which in turn will have stimulated different creative solutions, according to a *non-linear approach* (Chow, 2013).

It is evident how much this perspective favors more effective autonomous participation, i.e., it requires less mediation and adaptation of activities than a traditional approach and promotes the idea that each child can interact with others and with the environment by moving within his or her own *zone of proximal development* (Vygotskij, 1979).

This perspective emphasizes the crucial importance of directing educational intervention towards the child's motor, expressive, communicative, and participative abilities. The authors highlight the importance of structuring, for the child, a context for implementing activities that is stimulating, realistic and adaptable to the individual preferences and prerequisites of the learners (Pot et al., 2018). In this sense, it is necessary to promote physical education teaching practices that are respectful of intentionality, individual potential and that provide for an indirect structuring of the context in order to foster opportunities for effective activity and participation for all. Thus, from the earliest forms of motor investment, it is essential to consider the intentionality and spontaneous manifestations that the child expresses with and through his or her body, as possibilities for the child's functioning within the context of his or her peers. In other words, such manifestations represent a clear and tangible expression of his will, his peculiar subjectivity, his interests and, last but not least, his competences.

Key points for inclusive physical education

In light of what has been discussed so far regarding the need to foster inclusion in physical education, teaching proposals should be appropriately designed in full respect of individual needs, and act as a guide and support in fostering the development of psychomotor skills and abilities, in cognitive understanding and in the acquisition of social and emotional skills useful for building a better quality of life (UNESCO, 2015). The teacher modulates didactics "in situation" through a continuous reconnaissance of the learning environment, of the student/class group and of the "task" and proceeds in the modulation and re-modulation of his actions by adapting to the situation (Gison et al., 2012; Giaconi, 2015).

Especially in the planning phase of activities that encourage participation, the teacher cannot disregard the risks underlying the declination of a prescriptive approach, or rigidly designed in terms of limits to the possibilities of functioning, highlighting the difficulties of participation and peer comparison, with an inevitable disadvantage for those children who do not meet the minimum criteria required by the task.

It is essential to consider the extent to which the acquisition of any motor skill requires adequate teaching strategies aimed at and modulated in respect of the rhythms and learning styles, and of the pupil's abilities, without neglecting the ecological context of reference and the interpersonal dynamics that arise. At this point, we intend to reflect on the opportunity to identify those indispensable design elements and suggestions useful for "imagining" and "promoting" the greatest possible participation for each child, respecting as an unavoidable assumption the need to design interventions according to each child's particular *zone of proximal development*.

In an inclusive perspective, and thus with a view to enhancing diversity, rather than attempting to normalize it, it is fundamental to reflect on the fact that it is not so much appropriate to design exclusively adaptations of canonical activities designed and declined for everyone, as to overturn the theme and promote a rethinking of design practices also and above all starting from the child.

After an initial phase of observing children in natural and less structured environments, the teacher will be better able to identify the affordances that, more than others, could prove effective in promoting, effective motor investment, without giving up, either the goals or the sharing of experiences, in agreement with what is suggested by the nonlinear approach, which recommends the desirability of not decomposing practices, so as not to subtract motivation from the pursuit of the goal. "In contrast to the task decomposition characteristic of linear pedagogical approaches, nonlinear approach advocates (representative) task simplification" (Renshaw et al. 2010, cit. in Correia et al., 2018).

From this perspective, it would be appropriate to allow, using different materials, different modes of interaction, with objects and with the environment, to continue the purpose, to support motivation and encourage participation in activities, stimulating the development of adaptive functions and individualized forms of functioning. Exactly as is the case in inclusive interventions, where, after careful and prolonged observation of the child in the context of spontaneous movement/learning, there is an opportunity to identify spontaneous choices/initiatives and to understand the skills closely related to those areas of "enjoyment". The choice of a

movement, of a constraint, the spontaneous location within a space, the type of motor/cognitive/emotional investment is almost never accidental (Aucouturier, 2007). It depends on individual dispositions, personal background, the structure and functioning of cognitive/body systems that, over time, have taken on peculiar characteristics and that, therefore, significantly influence the orientation of action and perception itself. It seems evident how much this co-evolutionary logic cannot follow linear logics of execution, let alone of activity design, without inevitably running the risk of limiting an infinite range of possible motor and learning explorations.

It is not just a matter of thinking about how to make ordinary activities accessible and thus thinking about participation adapted with respect to the “demands” of the task, or the environment. This approach would respond more to logics of “integration” that, although they could foster through processes of assimilation and accommodation, the acquisition of new motor skills and competencies, would risk, on their own, generating a distancing from the activities or, at any rate, promoting a partial participation (in terms of intensity and quality of participation) in the activities that would hardly highlight the potential and, why not, the skills, the multiple and variable talents proper to each child. In an interesting article on the topic of sustainable teaching of motor activities, Borgogni (2016) emphasizes how the logic of structuring activities should aim, not so much at “[...] lowering the minimum performance limits (in sports language ‘the lowering of the bar’),” but rather stresses the importance of promoting a “[...] structural modification of teaching based on the assumption of the non-linearity of learning processes, particularly those in groups” (Borgogni, 2016, p. 121).

<i>Domains to take into account in pre-school and primary school:</i>	<i>Key points of inclusive planning</i>
☐ <i>cognitive domain strongly involved in motor learning;</i>	☐ <i>organising flexible teaching;</i>
☐ <i>emotional-relational domain facilitator of learning;</i>	☐ <i>re-evaluate the transversality of learning;</i>
☐ <i>motor domain medium of transversal learning.</i>	☐ <i>encouraging discovery and guided exploration;</i>
	☐ <i>give space to the non-verbal communication of the body;</i>
	☐ <i>encourage sense-perceptive activities;</i>
	☐ <i>adopting a playful approach</i>

<i>Domains to take into account in secondary school:</i>	<i>Key points of inclusive planning:</i>
☐ <i>cognitive domain to be stimulated through research activities, problem solving that leave wide margins for initiative and creativity;</i>	☐ <i>encourage opportunities for confrontation, healthy competition, respect for rules;</i>
☐ <i>communicative-relational domain to be fostered through peer-to-peer and cooperative learning (discussion, collaboration, positive interdependence);</i>	☐ <i>create moments that promote the development of empathy with activities to share emotions and feelings;</i>
☐ <i>emotional domain for better memorisation of learning;</i>	☐ <i>activating processes of awareness of feelings, emotions, perceptions and self-reflections experienced through communication techniques that favour the verbalisation and critical analysis of lived experiences;</i>
☐ <i>motor domain as learning amplifier.</i>	☐ <i>favouring problem solving activities as a way of active learning.</i>

Figures 1 and 2 show, in a synthetic way, the essential elements for the personalization of teaching activities and the methodological features that must be considered and re-evaluated when choosing and organizing the learning setting for physical education activities.

Fig. 1 e 2 – Key points of inclusive planning

The figures decline longitudinally in the different school orders of the different dimensions described so far, which are considered capable of enhancing everyone's opportunities for participation and the outcomes of the proposed activities in terms of motor skills and generalizable skills in different life contexts. The following boxes summarize the characteristics and priority teaching aspects to be considered in instructional design.

Discussion: applicative declination of the principles of nonlinear pedagogy according to an inclusive perspective

In the wake of a broader study of the literature that has long been initiated on the topic of the overlap between the dynamic, nonlinear trajectories traced in sport and motor learning and inclusive processes framed from a biopsychosocial perspective (D'anna et al, 2021; Minghelli et al., 2021; Minghelli & Coppola, 2023), this paper aims to reason about the elements of continuity and parallelism between the dynamic ecological approach and the biopsychosocial perspective of human functioning by highlighting their applicative repercussions on teaching practices.

Specifically, this section proposes an initial declination and systematization of the inclusive principles derived from the biopsychosocial approach and the principles of nonlinear pedagogy: it should be clarified that this systematization responds, exclusively, to an exemplifying will that does not exclude the complexity of the processes but, with respect to them, attempts to provide small intervention structures and theoretical references that are believed to underlie designs and practices. Studies report a certain resistance, concern, and inexperience on the part of sports teachers and instructors in declining less structured practices, for as clarified here and elsewhere (Rudd et al., 2021) this requires more skills in structuring environments and approaches, a directing skill that involves a "thinking before" and a "thinking for" that is far from simple (Minghelli & Coppola, 2023). However, it is necessary to suggest a reading and interpretation of this division into principles, which places the constituent elements of an inclusive and nonlinear approach in a complex dynamic relationship, according to a systemic perspective. So, these insights, far from wanting to provide a linear application key need to be deepened, implemented, observed, investigated and shared in order to be able, from the considerations of the new evidence gathered, to cautiously trace the vertices of infinite nonlinear tractable paths of possible inclusive practices.

The principles that guide educational choices, according to a nonlinear approach (Chow, 2013) can be summarized in the following points:

- *Designing representative learning environments*

The choice of the level of representativeness of the educational proposal is a crucial element underlying the concept of learning transfer. In the educational sphere, and especially from an inclusive perspective, this principle translates into an expanded concept of transfer, which is not only about the transferability of performance, but also about the concept of transferring learned skills (problem solving, decision making, initiative, communicating, collaborating, etc.) to everyday life contexts (life skills).

The teacher seeks through the creation of increasingly representative spaces the acquisition of skills and decision-making behaviors directed to specific goals of motor-sport practices, products of intentions, perceptions and actions experienced in the proposed activities.

- *Promoting movement pairings and movement-relevant information*

It is necessary to design practice environments that provide real learning opportunities for the student by creating optimal conditions for him or her to autonomously tune in and adapt to the proposed environment, making the most of the circular relationship between perception and action.

This principle, in full consistency with the principles of individual/environment interaction, in ICF terms, and with what is described by the greatest exponent of the Dynamic Ecological approach "we must perceive in order to move, but we must also move in order to perceive" (Gibson, 1979, 223 cited in Correia et al. 2018), allows us to understand the extent to which the child's motor investment in the appropriately structured environment will be an opportunity for experiences of perception and action in which the child will simultaneously and progressively activate a process of personal signification, which will be different depending on individual and contextual characteristics that will in turn co-evolve with it.

The observation of the child's bodily investment, the modes of participation, the choices made in relation to the affordances present in the context, aims at having the child's interests and motivations, potentialities identified, recognized and returned to the child, in order to progressively identify possible strategies and modes of intervention that can be implemented in a flexible, individualized and personalized manner.

In experiencing the recognition and attribution of meaning to his or her own initiatives, the child with disabilities will not only have the opportunity to experience opportunities for movement that are perfectly consistent with his or her zone of proximal development and thus to proceed realistically and effectively along his or her own developmental possibilities, but will also and above all perceive himself or herself as a "causal agent" capable of determining effects on the environment and on others and, in receiving information of acceptance and recognition of those initiatives, will be spurred to undertake more and more of them, independently and in relation to others.

- *Manipulating constraints*

It is desirable for the teacher to be able to manipulate constraints as best as possible to favor and facilitate the required actions by guiding the student to self-organization in the quest for executive stability of the task. In the first stage, it will be appropriate to provide advantages to the action by arranging facilitating conditions that create opportunities to achieve the goal successfully; in the second stage, constraints will be manipulated to destabilize the action and induce the pupil to seek new adaptations and stability (“invitations to self-organization”).

“The challenge for teachers is not just to understand how to manipulate constraints, but to identify key individual constraints that can be presented to students to encourage learning” (Renshaw et al. 2010, 134). Observation of the child’s individual functioning and development as a function of skillful manipulation of constraints in the environment should aim to identify the elements of this individual specificity, expressions of vicariousness, prevailing interests, and specific motor patterns, and make them a resource, recognizing and/or attributing meaning to that investment: both in terms of possibilities for functioning and movement, and in terms of intentionality and motivation. Reading motor investment is useful in capturing “the relations between intentions and perception and action in learning. What is needed by a learner, initially, is ‘soft-assembled’ plans: conditions of practice that facilitate exploration around a potential target behavior, verified by the needs of other learners with similar characteristics” (Correia et al., 2018, p. 120).

It will then be necessary to differentially orient possible evolutions, proceeding by trial and error and not by imagining unambiguous solutions and goals, in order to understand in which of the situations offered, more functional functioning, in terms of activity and participation, occurs.

- *Fostering exploratory learning by leveraging functional variability*

A key element of this approach is the creation of learning environments that are designed to provide opportunities for learners to be able to construct for themselves the “how, why, where, and when” of movement by spontaneously and heuristically enacting finalized actions and decision-making behaviors that are functional to the proposed activity. The design of the learning environment must necessarily take into account the variability that amplifies exploratory activity and adaptive behavior and, consequently, fosters the emergence of individualized functional solutions.

The construct of the zone of proximal development, along which interventions should be designed, is taken up here. Moving away from an aprioristic linear approach. The teacher’s task will be to imagine the possible evolution of that motor pattern and to think about the facilitation strategies that need to be implemented to encourage the expansion of experiences from the emerging skills (Gibson et al., 2012) detected.

Similarly, starting from the identification of the elements of transferability (motor gestures, materials) common to different sports practices, it will be appropriate to offer new proposals that take advantage of the familiarity, cognitive and experiential elements previously acquired, in the interaction with one’s own body, space and environment, to re-propose them in new forms (new goals, new environment, new executive forms), to foster the ability to generalize. This specific design element serves both to support the motivation to have the child/youth engage in a new activity and to design an activity better situated in the zone of proximal development, in which, with the help of a more experienced adult or peer he/she will have the opportunity to proceed toward new experiences and skills.

- *Reducing conscious control of movement*

The approach promotes awareness of one’s actions. Central to this assumes a central role, focused attention--giving directions that gradually focus on the effects of external movement (external focus), rather than internal ones (internal focus), allows one to harness available self-organization processes, implicitly, rather than through conscious control of movement. Similarly, from an inclusive point of view, considering, for example, spontaneous initiatives that are apparently not functionally goal-oriented, recognizing and/or attributing to them an implicit connection with intrinsic motivation and favoring their functional evolution, means interpreting and respecting them as “choices” according to which it will be important to increase the situations in which the onset of the child’s personal initiatives can occur. At this point, the teacher will have to identify and re-propose the elements (objects, spaces, contextual, spatial-temporal variables) that allow and indeed encourage their repetition, and not seek instead a more effective but passively re-proposed repetition. Framing the child’s spontaneous choices in an ad hoc structured educational “framework” that not only offers the possibility of experiencing those experiences, but also promotes their self-organization according to the environment and affordances, transforms those initiatives into starting points for effective future inclusive planning.

Conclusions

The teaching/learning process is a complex process that must take into account a number of variables, all of which are influential and often invisible to the teacher. The principles of the nonlinear approach placed in relation to the biopsychosocial approach, open up new perspectives of instructional design that can foster the creation of meaningful, effective and inclusive learning environments. The observation of the child’s motor investment in the context, according to the affordances present in it, allows the teacher to consider the starting situation in 360°, and to organize the learning environment to fit the pupil and/or the class group, in continuity with the zone of proximal development of each, in an individualized and personalized manner. It is an approach that has great potential for application in other subject areas as well, not only because it systematizes the

planning steps by guiding the teacher through the different design phases with a flexible approach, which allows teaching choices to be adapted to the non-linearity of the processes, but also because of the particularly inclusive imprint that characterizes it. The strong relationship with the representational environment, toward which to strive in the organization of learning environments (D'Anna et al., 2022), further emphasizes the functionality of teaching action, increasingly oriented to the promotion of competencies for life, competencies to be able to “be and know how to be in the world”.

Inclusion, posed in an ICF key and declined in the motor field, implies the need to observe and recognize the different abilities, potentials, initiatives of each child, as well as the importance of detecting and understanding the special need of each one, leaving the teacher with the sole task of soliciting the search for the most effective motor, expressive and communicative forms for himself (Borgogno, 1990). It is essential to allow the child to participate personally and effectively in the different structured and unstructured situations implemented in the classroom context, in which the needs, rhythms, perceptual, interactive, attention and learning styles of each person are respected and individualized and personalized strategies are employed (Minghelli et al., 2022;).

At the same time as the present study, tools are being prepared for an investigation that aims to examine whether, in addition to what has been gathered in the literature, it is also possible to identify in already implemented practices, elements that can be traced back to a conscious, or even unconscious, use of an integrated cognitive/heuristic approach in order to reflect, if so, whether and to what extent this positively affects the quality of inclusive participation.

There is a need to record the need, awareness, and practices, and to reflect together (i.e., across the specifics of the two fields and the different expertise of physical education teachers and support teachers) on the fallout in order to better target teaching and training interventions that are more effective in promoting motor learning, life skills, and inclusion.

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