27 - NEUROSCIENCE, PHYSICAL EDUCATION, LEARNING AND HEALTH PROMOTION: DIALOGUE NEEDED

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doi:10.16887/87.a1.27

Introduction

Neurosciences are a set of disciplines that study the nervous system and was born seeking the brain bases of the human mind. Anthropological records show skulls of more than 7000 years with surgeries signs made in living subjects with goals not certain, but it is speculated that to treat headaches, mental disorders or scare away the "evil spirits" (BEAR et al, 2008, p. 5).

The relationship between the nervous system, consciousness and cognition are suggested since the century III B.C in Egypt, where Herófhilus and Erasistratus opened the dissecting brains. After centuries of research, dissection, through electrical stimulation and other methods, the major difference in this quest takes place from the 1980s, with the introduction of imaging technique using magnetic resonance imaging of the living brain, which expanded the horizons of Neurosciences (HERCULANO-Houzel, 2013).

These studies comprise diverse lines as neuroanatomy, neurobiology, Neuroendocrinology, neuropharmacology, Neurogenetics, neuropsychiatry, neuropsychology neurochemistry, among others, but that have in common one pathology study bias.

According to Herculano-Houzel (2013), the neurologist Antonio Damasio presented a recent advances in neuroscience through an objective study of the neural basis of emotions, demonstrating through functional imaging that emotions are not abstractions, but bodily predispositions that result from the interaction body brain ;thus is born a full body consciousness Neuroscience where emotions and consciousness are inseparable.

The results of research in neuroscience in the last 30 years have had little impact on education, although offers us the opportunity to fill essential gaps in the field in general, but has, however, particular interest to the Physical Education, specially in relations between motricity and learning, motricity and health and health promotion. This knowledge is here treated as necessary and urgent dialogue to physical education in its operation in Education, in Learning and Health Promotion.

In its affiliation to biomedicine, physical education was gained entirely inserted in the Cartesian paradigm and an object body view, fragmented body, seen as a machine to overcome their limits, disciplined, dichotomized, hierarchical and subalterned to the mind, the soul, the spirit, consciousness, standardized and subjected to rigorous protocols and proportionalities. Although we still live in a hegemony environment of that Cartesianism, increasingly appear serious reasons to dismiss it, from a vision of integrated body or Corporeity. It, helps a lot in a closer dialogue with the neurosciences, but a careful dialogue, result of a refined search, as there is still cartesianism everywhere, including the neurosciences, because resist here and there certain dualistic view of mind and body.

Relations between Motricity, Cognition, Learning and Health Promotion

In recent decades the contributions of neurosciences helped topple myths, such as we use only 10% of the brain, not neuronal regeneration or permanent loss of neurons, the undervaluation of the body in opposite the primacy of the mind, the devaluation of emotions in the face of reason and the lesser importance of the motor front of rational processes; where silence and immobility were considered necessary prerequisites to the best high cognitive performance. We now know the brain plasticity and neurogenesis in the hippocampus may be extended under certain conditions, for life, and that the interactions body and brain are unity, partnership, without hierarchies as declares Damasio (2000, p.113), stating that "the body and the brain inseparably are integrated by reciprocal biochemical and neural circuits directed at each other, the body being the fundamental reference of the mind, since “[...] the body contributes more that with maintenance of life and with more than modulatory effects. Contributes an essential content for the operation of the normal mind "(Damasio, 2000, p.257).

Another overthrown myth is the separation between reason and emotion, since "[...] the emotional foundation of the rational is not a limitation [...]. Rather, it is its condition of possibility [...]” (Maturana, 1999, p. 18).

The understanding that emotions are part of the reason is not new, it appears from the 1930s in Reich (1983), and also in Maturana (1999), Damasio (2000, 2004), Atlan (2002), Ratey (2002), Ratey & Hagerman (2012), among others; but it seems timely here the need to rescue the statement Atlan (2002, p.13) when states: "From Plato to Descartes, fell to the ground all previous visions of a soul governing body as a coachman governs his horses" (ATLAN 2002, p.13).

So in comes clear the argument of Damasio (2000) when discussing what he calls "Descartes' Error," states the "I exist and I feel, therefore I think," not to provoke a conceptual controversy between neurobiology and philosophy to contrary to the known "I think, therefore I am" Cartesian, but to try to elucidate the intricacies of life, for indeed, "[...] we exist and then think, and only think as we exist, because the thought is indeed, caused by structures and operations of being" (DAMASIO, 2000, p. 279).

For the author, it is a protest and a reproach to Descartes “[...] to have convinced biologists to adopt, to date, a watchmakers mechanical modeling of life processes "(DAMASIO, 2000, p. 279).

In this scenario, the emergence of surprises also comes in various unexpected directions, as the strong contribution of research at the Alzheimer's field of study, Stress and Obesity studies, where the most general conclusion is that physical inactivity is more deconstructive and damaging the we thought.

As pointed out Ratey & Hagerman (2012):

The sedentary nature of modern life is a break with our nature and is one of the greatest threats to our survival. [...] What is even more disturbing, and no one recognizes, is that inactivity is also killing our brains - dwarfing them physically (Ratey & Hagerman, 2012, p. 12).

[...] Nowadays there is a growing gap between the evolution of our biology and our society (Ratey & Hagerman, 2012, p. 67).

Still reverberating surprises Póvoa (2000, p. 11-18, 46) tells us that the intestine was recently declared the "second brain" both by their common protoembrionary origin with brain tissue, both to be in the organism, the only organ capable of

performing functions without control of the central nervous system, is also responsible for 80% of our immunity, a major producer of GH and acetylcholine precursors of several neurohormones such as serotonin, for example. Thus, we can infer the fundamental importance of the intestines for good cognitive functioning associated with a balanced diet.

In addition to what was known about the cerebellum, for example, the great coordinator of the motricity, it appears now that it has 50% of brain neurons, intriguing percentage to allow speculation about the real importance of motricity for life, as well coordination of thoughts, attention, emotions and social skills. In evolutionary terms, "To each neuron added to the cortex, the cerebellum wins four '(LENT, 2011, p. 127).

For these conclusions were fundamental studies on aging by Coltman (1995, cited in Ratey & Hagerman, 2012, p.51) that "[...] established a direct connection between the movement and cognitive function. And in doing so, paved the way for the study of exercise in Neuroscience "(Ratey & Hagerman, 2012, p. 51).

Ratey & Hagerman (2012) emphasize that "[...] were born to move on" and which we usually refer to as thought has been motricity:

What we call thinking is the evolutionary internalization of movement. As our species evolved, our skills were developing and transforming the abstract skills to predict, sequence, calculate, plan, rehearse, self-observe, judge, correct errors, change tactics and then remember everything we did for we can survive. The brain circuits that our ancient ancestors used to make a fire are the same we use nowdays to learn French. (Ratey & Hagerman, 2012, p. 46)

These findings place the Motricity in the protagonism due to it, since movement is cognition, it causes neurogenesis, creates dendrites and strengthens the synapses, coordination of thoughts, attention, emotions, social skills and cognitive timing. The most pleasing surprises for Physical Education, by itself already imposes a radical reorientation of school physical activities, is the biological connection between motricity and cognition has its "gold standard" in the moderate aerobic exercise (emphasis added), which produces and intensifies neurohormones discharges and its setting, increases the brain derived neurotrophic factor (BDNF) related to cell (re) construction, promotes divergent thinking and creativity, increases and adjusts the levels of endorphins, dopamine, thus promoting cognition, the qualification of learning and health. It should be noted that motor complexity is the complexity of thoughts (Ratey, 2002; Ratey & Hagerman, 2012).

On the other hand, searches the correlation between cognitive function and strenuous exercise showed a decrease of the cognitive performance in exhaustive exercise. Hanna et al (2006).

These results, in part, may be understood by sophisticated circuits involving adjustments between adrenaline, cortisol and endorphin. That is, the greater presence of adrenaline, we know, is the basis of the defense mechanism "fight or flight", cortisol is released as a compensatory response and to better manage the "fight or flight"; it means that, more than to block the insulin receptor in tissues and organs, also change on the liver functions to provide greater glucose contribution in the bloodstream. If the frame is durable, endorphins are released to appease the pain, this circuit is known as HPA (hypothalamic, pituitary, Suprarenal) and while the body is using energy to keep the alert, will be leaving uncovered areas related to thinking. Excess cortisol implies wear neural connections, destruction of memory, lock existing memories, and hinder new learning (Ratey & Hagerman, 2012).

We may in this framework include sports activities, as the body landscapes of adrenergic predominance, the circuit described above operates impactful way, emphasizing the deleterious nature of adrenaline in cognitive functions.

In a recent interview, the researcher Pedro Hallal from Pelotas University pointed out that even Brazil's success in promoting the Olympics is a failure in terms of physical education, as its main objective should be to promote academic achievement, and not be restricted to fighting inactivity, prevention of obesity and metabolic diseases. He also emphasized the need to increase the number of classes to three times a week and countered the myth that the best students are those who do activities: "To be idle is to be short as possible," he said. Hallal also criticized the Provisional Measure 746 of 2016 that proposes to reformulate the high school and waving with the withdrawal of compulsory physical education from grade school, an initiative he refutes the argument about the benefits of physical activity activity in cognitive development, prevention of depression in children and adolescents, as well as the promotion of socialization. The researcher also defended more diversity in the classroom in order to attract students.

Herculano-Houzel (2005) points out that between 11 and 18 occurs in adolescents great chemistry and neurological revolution that will reshape the whole brain as a cutting phase, refinement and maturation. The many connections brought from childhood and little used are abandoned; the compensation system changes leaving the teenager almost permanently dissatisfied with many mood swings and sleep disorders. The changes of body uncontrolled growth distorts the self-image may give rise to the need for a collective or group identity. This behavior is the result of an immature brain, in transformation, it is also conducive to irresponsibility phase, because they operate with immediacy and difficulty of measuring the consequences of their actions and to feel empathy; this ability to put yourself in the other's place is a late and sophisticated acquisition. As a result of this whirlwind of impulsivity, with the discovery of sex and the search for novelty, they may be exposed to risks of all kinds. On the other hand, it is an excellent occasion for studies and new interresses as philosophy, politics and religion. So, all these changes have the potential to form an independent and sensible adult. In this phase a physical activity program is critical to promote cognitive development and modular this transition, including modular sleep, since sleep is to consolidate the learning.

It should be noted that the movement, physical activity and exercise are the regulators best in bodily functions and are organically related to emotions, cognition and learning, that is, the more we move, we tend to become more healthy and intelligent. And as the brain is a social organ, where there is no connection, communication, there is no life; when we move tend to increase our neural networks and to establish greater communication between them. Obviously this is not true for repetitive, mechanical and automated movements. Now, it's all a matter of balance.

Education, Physical Education, Mobility, Cognition and Learning

Neurosciences cause us to show that the motor function of the brain, in addition to the movement, it is crucial for all other functions such as perception, attention and emotion, affecting cognitive processes of memory, cognition and learning (Ratey, 2002).

Damasio (2000, p.15, 2004) tells us that the body is state qualifier thought, "[...] whether positive or negative, is accompanied and complemented by a corresponding way of thinking." What explains us that the painful body landscapes are accompanied by slow thinking and automated reasoning, with a focus on painful experience and consequent insight, a favorable scenario for impotence feelings of low esteem, dependency, organic stasis and a decrease of immunological reactions, which results in an increased risk of disease. And the pleasure of physical landscapes are accompanied by a quick-thinking and creative thinking, as well as a mental predisposition and expansion aspirations in the world. This scenario favors a sense of empowerment and increased self-esteem, self-reliance and an increase in immune reactions, which results in facilitating learning and health promotion.

Dopamine, considered neurohormone of Knowledge has its excellence in production in activities and moderate exercise and note, pleasant. This suggests that physical exercise for health promotion are more effective if carried out in an atmosphere of joy and spontaneity, need not and should not be strenuous nor involve pain. Since, "forced exercises do not give much result as voluntary exercises" (Ratey & Hagerman, 2012, p.15).

This information directly affect the physical education and point to a restructuring.

The most recent appropriations of the brain and obesity research arises a tendency for dynamic in classrooms, already being implemented in pilot projects in the US, Canada, England and Australia, which refers to the school furniture change and students attend classes standing in front of high tables with a bench next to an optional and quick rest; this dynamic has registered the increase of concentration, participation, caloric expenditure and improving academic performance, as can be seen from the Katzmarzyk research (2010).

This concrete fact and also very curious shows us that the school, from its origins, influenced by a mentalist view of intelligence and learning, struggled the most to keep the students sitting, quiet, silent and penetrated to study and learn, as understood silence, inaction and suffering as maximum expressions of academic performance and the remains shown is that cognition and learning are, in fact, related to movement, pleasure and playfulness. It should be noted that the playfulness has a biophysiological anchoring in pleasurable bodily landscapes, otherwise, we can slide into the training and automatism.

Moreover, all this integration is orchestrated by neurohormones whose production is stimulated just by the movement, "it is a question of growth versus decay, activity versus inactivity, [...] if we are not moving in, there is no need to learn something" (Ratey & Hagerman, 2012, p. 60).

What reaffirms the importance of physical education for student development, especially in the early grades with

[...]playfull activities that involve corporeality, space and time in a perspective of the base motor organization where the concepts of global and fine motor coordination, spatial structure, temporal orientation, laterality, body structure and balance are key, especially for its relations with learning, since their deficit development may cause obstacles or problems in reading, writing, in its graphical direction, in distinguishing letters, the ordination of syllables in abstract thinking and logical, grammatical analysis, apprehension of verbal times by blurring or rhythmic difficulty, length of senses, duration and succession, so necessary to distinguish of present, past and future and some math skills, among others. (ASSIS & Pagés, 2014, p. 625).

Considerations:

The attempt here exercised was to argue in a brief overview, that are necessary and urgent inafastáveis dialogues among Education, Physical Education and Neurosciences, as recent findings strongly impact knowledge until then consolidated on learning and health promotion, imposing, thus, an extension of the theoretical horizon, with also imposing and consequent reorientation of practices in the classroom. We need to know more to act better.

The twists around the role of motricity in the learning process are exemplary and has the gift of putting Education in uncomfortable situation, because the more knowledge on how to learn, save a lot of hypocrisy, forcibly modify ways of teaching and demand, indeed, one reestururation which can take long, as the recent knowledge need to assimilate and reflected on práxis. But for that you need to start the conversation.

In physical education, with Cartesian perspective of the body, we were looking at only one side of the coin, the physical fitness. We also need to look the other, in a more holistic perspective of Corporeity to multiple body landscapes, that with its network of neurohormones and neurotansmissores has, even, direct action on physical fitness and turn on cognition and learning, the later, which should never be confused with training.

Thus, in a practical perspective that favors cognitive and learning, the Physical Education needs first of all to mediate with the students the risks of substitute activity for technology, needs to be a seductive, pleasurable physical education, favoring the circuit of dopamine, dynamic, challenging, problematical, significant, non-repetitive, since the repetition has no new learning because the circuit closes. Need a proposal that encourages the student to his self knowledge, especially their emotions and recognize them also as a pillar of their cognitive process, self-esteem, empowerment, autonomy - emancipated citizenship. A physical education for all, without constraints, to escape scenarios where "The cruel irony was that shy, clumsy, those out of the way - some of the children who could most benefit from the exercises were left out, in the stands." (Ratey & Hagerman, 2012, p. 37).

For this purpose is necessary the expansion of theoretical horizon with imposing and consequent reorientation of practices in the classroom, so that the physical education professional can better understand and properly, talk to its métier without getting being translated or ventriloquist by doctors, psychologists, psychiatrists, physiotherapists, among others. On the other hand, we need to establish an educational perspective in Neurosciences, because much of what we have available in the field of biomedicine, understandingly is facing pathologies, syndromes, disorders, etc., a picture that does not meet in full. Paraphrasing Nifelcoff (1992), we need a neuroscience to come from us.

In this reorientation, is suggested the concept of Corporeity as central theme of learning and Health Promotion in the School, as anticipated in Pagés (2011):

[...] Activities and exercises to favor learning and health promotion should include criteria which in practice means: status of physiological need, individuality, intrinsic and not instrumental playfulness nature, regularity, diversity, solidarity and camaraderie, without losing sight that are not being mobilized only muscles and joints, but sensations, emotions, feelings, thoughts and actions, life senses, in short, people; not bodies, but corporeity. (Pagés, 2011, p.15).

Also proposed by Assis and Pagés (2014), according to the Corporeity in a non-limited vision or reductionist on organic as argued, on the contrary, to recognize the Corporeity the need for a paradigm shift to overcoming the artificial division and among the biological, social and cultural and so familiar dichotomies considered antitheses: Individual x Society, Nature x Culture, Reason x Emotion, Objectivity x Subjectivity. Is to acknowledge that we are Corporeity in the world and thus one biosocial constitution of life history with its particular existential appropriations of the world around, with which are two-way street.

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Key Words: Neurosciences, Physical Education, Learning, Health Promotion

Abstract

NEUROSCIENCE, PHYSICAL EDUCATION, LEARNING AND HEALTH PROMOTION: DIALOGUE NEEDED

In recent decades the study of the brain had intensive development and eventually set up a multifaceted field of knowledge called Neuroscience. These advances, in addition to bringing down myths, revealed big surprises that have been assimilated by various human activities, from medicine to marketing. However, in the field of education and specifically in Physical Education, this appropriation is still incipient, particularly as regards the relationship between Motricity and Learning, Motricity and Health and Health Promotion. Thus, the search test this problematize some contributions to the field of neuroscience brings to the Education and Physical Education, but are still little known and used.

Key Words: Neurosciences, Physical Education, Learning, Health Promotion

Résumée

NEUROSCIENCE, ÉDUCATION PHYSIQUE SCOLAIRE, APPRENTISSAGE ET PROMOTION DE LA SANTÉ : DIALOGUES NÉCESSAIRES

Dans les décennies récentes, les études du cerveau ont eu un intense développement et ont fini pour configurer un camp aux multiples facettes de la connaissance dénommée neuroscience. Ces développements, au-delàs de rompre avec les mythes, ont mis en évidence les grandes surprises qu'ont été assimilées dernièrement par plusieurs activités humaines de la médecine au marketing. Cependant, au niveau de l'éducation et spécifiquement dans l'éducation physique à l'école, cette appropriation est encore naissante, en particulier à ce qui concerne aux relations entre motricité et apprentissage, motricité et santé e promotion de la santé. Ainsi, le présent essai cherche à problématiser quelques contributions que le camp de la neuroscience apporte à l'éducation et à l'éducation physique, mais qui sont encore peu connu et utilisées.

Mots clés: neuroscience, éducation physique scolaire, apprentissage, promotion de la santé

Resumen

NEUROCIENCIAS, EDUCACIÓN FÍSICA, APRENDIZAJE Y PROMOCIÓN SALUD: DIÁLOGOS NECESARIO.

En las últimas décadas el estudio del cerebro tenía un desarrollo intensivo y, finalmente, creó un campo de múltiples facetas del conocimiento llamada Neurociencia. Estos avances, además de derribar mitos, revelaron grandes sorpresas que han sido asimilados por diversas actividades humanas desde la medicina hasta la publicidad, sin embargo, en el campo de la educación y específicamente en la educación física, esta apropiación es aún incipiente, especialmente en lo que respecta la relación entre la Motricidad y aprendizaje, la motricidad y la Salud y Promoción de la Salud. Por lo tanto, la prueba de búsqueda de este problematizar algunas contribuciones en el campo de la Neurociencia lleva a la Educación y Educación Física, pero todavía son poco conocidos y utilizados.

PALABRAS CLAVE: neurociencias, la educación física, aprendizaje, Promoción de la Salud

Resumo

NEUROCIÊNCIAS, EDUCAÇÃO FÍSICA ESCOLAR, APRENDIZAGEM E PROMOÇÃO DA SAÚDE : DIÁLOGOS NECESSÁRIOS

Nas décadas recentes os estudos do cérebro tiveram intenso desenvolvimento e acabaram por configurar um campo multifacetado de conhecimento denominado Neurociências. Estes avanços, além de derrubarem mitos, evidenciaram grandes surpresas que têm sido assimilados por várias atividades humanas desde a medicina ao marketing, Contudo, no campo da Educação e especificamente na Educação Física Escolar, esta apropriação ainda é incipiente, em especial no que se refere às relações entre Motricidade e Aprendizagem, Motricidade e Saúde e Promoção da Saúde. Assim, o presente ensaio busca problematizar algumas contribuições que o campo das Neurociências traz para a Educação e para a Educação Física, mas que ainda são pouco conhecidas e utilizadas.

PALAVRAS CHAVE: Neurociências, Educação Física Escolar, Aprendizagem, Promoção da Saúde