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ARTICLE

Foundations for physical education: biology and psychology in periodical press about teaching and techniques (1932–1960)

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ABSTRACT

It analyzes the practices of author's appropriation of the theories of biology and psychology in the periodical press of education and techniques (1932–1960). It has, as a source, the *Revista de Educação Física* (*Journal of Physical Education*) and *Revista Educação Physica* (*Physical Education Journal*), and uses, as theoretical and methodological assumptions, the concepts of analysis through materiality and appropriation practices. These articles provided the basis for the process of schooling of physical education, constituting it as modern, rational and scientific. The publication of this list of knowledge sought to form a new conception of teacher, showing him the need to know the characteristics of the students, so that the exercises were properly dosed. These theories were appropriated and materialized in reading devices, with the purpose of orienting the teacher in relation to the teaching of the discipline. The research indicates that the dialogue with biology and psychology implies the production of a practical theory for physical education.

KEYWORDS

physical education; theoretical basis; periodical press.

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FUNDAMENTOS PARA EDUCAÇÃO FÍSICA: A CIRCULAÇÃO DA BIOLOGIA E DA PSICOLOGIA NA IMPRENSA PERIÓDICA DE ENSINO E DE TÉCNICAS (1932–1960)

RESUMO

Analisa as práticas de apropriação dos articulistas às teorias da biologia e da psicologia em circulação na imprensa periódica de ensino e de técnicas (1932–1960). Possui como fonte a *Revista de Educação Física* e a *Revista Educação Physica* e utiliza como pressupostos teórico-metodológicos os conceitos de análise pela materialidade e práticas de apropriação. Os artigos desses periódicos ofereciam as bases para o processo de escolarização da educação física, constituindo-a como moderna, racional e científica. A publicação desse rol de saberes buscava formar uma nova concepção de professor, mostrando-lhe a necessidade de conhecer as características dos alunos, para que os exercícios fossem adequadamente dosados. Essas teorias foram apropriadas e materializadas em dispositivos de leitura, com a finalidade de orientar o docente em relação ao ensino da disciplina. A pesquisa sinaliza que o diálogo com a biologia e a psicologia implica a produção de uma teoria prática para a educação física.

PALAVRAS-CHAVE

educação física; bases teóricas; imprensa periódica.

FUNDAMENTOS PARA LA EDUCACIÓN FÍSICA: LA CIRCULACIÓN DE LA BIOLOGÍA Y LA PSICOLOGÍA EN LA PRENSA PERIÓDICA DE ENSEÑANZA Y TÉCNICAS (1932–1960)

RESUMEN

Analiza las prácticas de apropiación de autores a las teorías de biología y psicología en circulación en la prensa periódica de educación y técnicas (1932–1960). Su fuente es la *Revista de Educación Física* y la *Revista Educación Physica*, y utiliza como supuestos teórico-metodológicos los conceptos de análisis a través de la materialidad y las prácticas de apropiación. Estos artículos sirvieron de base para el proceso de escolarización de la educación física, constituyéndolo como moderno, racional y científico. La publicación de esta lista de conocimientos buscó formar una nueva concepción del maestro, mostrándole la necesidad de conocer las características de los estudiantes, para que los ejercicios se dosificaran adecuadamente. Estas teorías fueron apropiadas y materializadas en dispositivos de lectura, con el propósito de orientar la enseñanza de la disciplina de los maestros. La investigación indica que el diálogo con la biología y la psicología implica la producción de una teoría práctica para la educación física.

PALABRAS CLAVE

educación física; bases teóricas; prensa periódica.

INTRODUCTION

"What is physical education?". This question, raised by Fernando de Azevedo in 1919, in his study *Da educação física: o que ela é, que tem sido e o que deveria ser*,[1] [Physical education: what it is, what it has been and what it should be], presented the author's understanding of physical education as a scientific method, whose principles were based on biological theories, which would guarantee the "rigorous" demonstration of the results that it could attain. For Azevedo (1960, p. 43), the articulation of physical education with biology and psychology would contribute to the integral formation of human beings, in which moral education would be influenced by the correct performance of exercises, developing the "[…] will for and habit of intelligent efforts".

This same problematization was later raised by Lourenço Filho in 1933. His questioning does not suggest *a priori* definitions about what was considered the "great problem of physical education" at the time, namely, "gymnastics or sport". The author sought to expand the questioning presented in the educational scenario, since from his perspective, physical education was not restricted to one or another practice, but extended to schooling, based on a project of integral education, in which there is no distinction between "physical education, intellectual education and moral education" (Lourenço Filho, 1933, p. 5).

The defense of the insertion of physical education in schools was based on the various bodies of knowledge that offered it "[…] more solid bases, that the daily *science* [would provide]" (Lourenço Filho, 1933, p. 5, emphasis ours). The recognition of the theoretical fundaments on which it was based and expanded is thus imperative, because otherwise "[…] it would be dominated by simplistic ideas such as [...] anatomy" (Lourenço Filho, 1933, p. 5). With these criticisms, it was Lourenço Filho (1944, p. 10) himself who revived the complexity of the field of biology, particularly because, in his view:

> […] What is certain is that the biological aspect is essential. Even if we do not dispense with the others to respond to objections, we would say that education is like a triangle […]. The biological aspect will be represented, whether we like it or not, as the basis of the entire construction.

Amid the debates suggested by Lourenço Filho (1933, 1944) about the branches of sciences that supported physical education, it was of the "utmost importance" that teachers appropriate, as Azevedo (1937a, p. 15) also emphasized, "[…] the subjects that support or give foundation to physical education [to respond to the concerns for a] new orientation in the formation of educational personnel". The success of the "great work" to insert physical education in school curriculums depended on the preparation of teachers, because "[…] to the degree that [it] takes on this *scientific character,* responsibilities [increased]" (Azevedo, 1937a, p. 16).

1 This study was published in three editions (1916, 1920, 1960). In this article, we dialog with the 1960 edition.

Both articles demonstrate that the elaboration of theories and the development of studies to guide teaching of physical education already had been circulating in journals dedicated to its teaching and techniques, since the 1930s. The fact that the epistemological bases were not consensual, as seen in Lourenço Filho (1933, 1944), suggests to us negotiation processes whose purpose was to announce the nature of modern and systematized scientific knowledge, as that which would provide the basis for teaching physical education in schools, without reducing its potential.

In this light, the objective of this article is to analyze how writers appropriated (Certeau, 2002) theories from biology and psychology that were presented in journals dedicated to teaching and techniques of physical education (1932–1960).[2] The central argument is that these theories circulated in the journals to shape a "new" concept of teacher, and by doing so, provided opportunities for teaching physical education, which were materialized in reading devices.

A reading of the *body of documents* used in this study revealed characteristics similar to those found in the journals aimed at the broader field of education, particularly by also publishing articles whose objective was to guide the practice and education of professionals who worked in school institutions. Because of their rich contribution to the history of education, these journals, as sources and objects of studies, have provided the bases to consolidate a trajectory of research about the theme.

Among the researchers who have been dedicated to the issue, Catani (1994) states that the specialized journals on education offer a privileged source for grasping the modes of functioning of the educational field, by circulating information about pedagogical work, the improvement of teaching practices, the teaching of specific disciplines, the organization of systems, the needs raised by teachers, and the participation of the agents who produced the journals in the organization of teaching systems and the elaboration of discourses that sought to instill exemplary practices.

From this perspective, the educational journals became specialized sources of analysis and information, allowing historians to present emphases, recurring themes and information about the authors, at the same time that they allow identifying the "[…] modes of constructing and promoting the legitimate discourse about issues of teaching and the set of prescriptions or recommendations on ideals of performing the work of teaching" (Catani and Souza, 1999, p. 11).

Meanwhile, Carvalho (2001) analyzed the materiality of the journals intended for teachers, using them as sources and as objects, focusing on the strategies for promotion, imposition and appropriation of pedagogical knowledge found in these

2 This article is an offshoot of the umbrella project *Da imprensa periódica de ensino e de técnicas da educação física: trajetórias de prescrições pedagógicas (1932-1960)* [Journals dedicated to teaching and techniques of physical education: trajectories of pedagogical prescriptions (1932–1960)] which investigates how the objectives, methodologies, technical details, contents of teaching and evaluation were systematized in journals in the field. The project is financed by the Fundação de Amparo à Pesquisa e Inovação do Espírito Santo (FAPES — The Research and Innovation Support Foundation of Espirito Santo), edital universal n. 006/2014 — processo n. 67.6438.25.

documents. The author's focus was on the analysis of these documents as devices that organize the time and space of schools, which normalized the knowledge aimed at teaching, as well as the practices dedicated to learning by students. This emphasis allows historians to diversify their analyses to the multiplicity of material devices, which are considered to be cultural objects with specific purposes.

For Carvalho, the journals aimed at teachers were produced: with a basis in modern pedagogy understood as "art of teaching", and were configured as "tool boxes" which prescribed "things to be used" and models to be imitated by teachers, lesson plans and exemplary practices; and based on the concept of Pedagogy of the New School, offering theoretical, scientific and philosophical foundations to the teaching practice, through "pedagogical collections" (Carvalho, 2001).

In dialogue with these studies, we understand that the journals dedicated to teaching and techniques of physical education (Ferreira Neto, 2005a) have similar purposes to other educational journals analyzed by educational historians. Published since the 1930s, in magazine format (in book and A4 sizes), these educational printouts fought for schooling, professional education and specific laws related to physical education. The writers and editors also present methodologies for teaching gymnastic exercises and published theoretical references that supported pedagogical practices.

These findings reveal the concerns of the journals about the teaching of physical education, approximating the nature of these sources to those analyzed by Catani (1994), Catani and Souza (1999) and Carvalho (2001). Concomitantly to these similarities, Ferreira Neto (2005a) examined specific articles about sports, which sought to deepen readers knowledge about facilities, materials, technical details and news about sports organizations. Based on these characteristics and in dialogue with Faria and Pericão (2008), Ferreira Neto came to call these journals the periodical press on teaching and techniques, because a technical publication referred to that which exclusively concerned certain themes, in this case, sports. Thus, among journals about teaching physical education, a type of technical publication developed, causing publishers of different natures to dialogue on the pages of journals intended for teachers.

In this case, as discussed by Cassani (2018), the development of the *technical publishers* among the *educational publishers* revealed that to insert and consolidate physical education in schools, it was also necessary to promote specificities concerning what, how, when, for whom and where to teach and learn sports. To serve the broader goal of physical education, whether for schoolwork or in other spaces, it was not possible to separate the two forms of publishers, which mutually nourished each other.

THEORY AND METHOD

We used as a reference studies by Roger Chartier (2002) that analyzed printed journals. We consider the sources to be products of relations between different authors and editors, understanding them as cultural objects, by means of which knowledge, models and forms of thinking are presented for reading. The author

offers us the bases for focusing on the multiple devices that were strategically produced by writers and editors to "induce" the reading of the journal, because "[…] it should be remembered that no texts can exist independently from the support that allows the reading, and emphasizes the fact that there is no understanding of a text, whatever it is, which does not depend on the forms through which it reaches readers (Chartier, R., 2002, p. 127).

Influenced by the work of Anne-Marie Chartier (2002), the sources were understood to be *devices*, because we recognize the inventiveness and different interests of writers and editors involved in producing the debates that circulated in the journals, assimilated by realities that were represented and established. To conduct the analysis, we also use the concepts of *uses and appropriations* (Certeau, 2002), which are different forms of interpretations that constantly dialog with practices that produce order, in this case, with theories from biology and psychology incarnated and presented for reading in the journals, offering the bases for teaching physical education.

Based on Carvalho (2006), we consider the intrinsic relationship between written text and the forms with which it reaches the reader. We analyze how the journals are constituted as a product of editorial strategies to promote and shape pedagogical knowledge. In this way, the reading devices used by editors and writers were considered didactic-pedagogical prescriptions, which conform and articulate with pedagogical norms presented by the journals.

The selection of the period of the journals analyzed, 1932–1960, is based on internal and external reasons. Internally, 1932 is the year of publication of the first issues of the journals that have the editorial profile discussed by Ferreira Neto (2005a), dedicated to guiding the practice and education of professionals who would work in school institutions. The journals are: the *Revista de Educação Física* (*Journal of Physical Education*) and *Revista Educação Physica* (*Physical Education Journal*). Externally, reasons are associated to the year of termination of these journals dedicated to teaching and techniques, 1960, because, fulfilling their purposes, they ceased publication, "[…] failing to find their place in the 21st century" (Ferreira Neto, 2005a, p. 776).

With the insertion of physical education in schools and the regulation of the education of teachers in higher education, the editors and writers understood that it was up to teacher education courses to teach future teachers about the organization and planning of their pedagogical practices. According to Ferreira Neto (2005a, 2005b), since the legal space for physical education was guaranteed by the contributions of these journals, gradually, after 1960, the publications came to be shaped as *scientific journals*, a fruit of the need of the academic community to guide the field by means of research linked to undergraduate and graduate studies, to scientific societies and professional associations.

Based on these specificities, we use as a reference the mapping produced by Cassani (2018), from a total of 1,783 articles published in the *Revista de Educação Física* (*REF*) (1932–1960), *Revista Educação Physica* (*REPhy*) (1932–1945), *Boletim de Educação Física* (*BEF* — The Bulletin of Physical Education) (1941–1958), *Revista Brasileira de Educação Física* (*RBEF* — The Brazilian Journal of Physical

Education) (1944–1952) and the *Arquivos da Escola Nacional de Educação Física e Desportos* (AENEFD — The Archives of the National School of Physical Education) (1945–1966).

Considering the objective of this study, we used *REF* and *REPHy* as specific sources . The *REF*, accredited by the Escola de Educação Física do Exército (EsEFEx — Physical Education School of the Army), sought to propagate orientations for teaching physical education based on the institution's pedagogical principles. Meanwhile, the *REPhy* was organized by civilian scholars and published by Companhia Brasil Editora S. A., a private and commercial company. The objective of the journal was to promote the scientific foundations of physical education and the programs of exercises to be applied in school institutions, establishing itself as a reference in Brazil and other countries (Revista Técnica, 932, s/p.).

In these journals, we analyze the articles that offer the theoretical bases for teaching physical education supported by biology and psychology. These fields of knowledge were organized according to approximations between the epistemological nature and the object of study of the different "science groups" in a process that recognized the dialogue established by scholars among different fields of knowledge. Table 1 presents the quantitative distribution of the articles by journal:

Table 1 – Distribution of the articles.

Foundations for physical education	Journals		
	REF	*REPHy*	Total
Biology	24	67	91
Psychology	10	13	23
			114

REF: *Revista Educação Física*; *REPHy*: *Revista Educação Physica.*
Source: Research database.
Preparation of the authors.

In addition to the analysis of these articles, to better understand the way that the foundations of biology and psychology were materialized in the orientations for teaching physical education, this study also consulted articles of a prescriptive nature published by the journals.

The articles were selected by identifying titles that referred to orientations for physical education, found in the printed version of the *Catálogo de Periódicos de Educação Física e Esporte* (Catalog of Physical Education and Sport Journals) (Ferreira Neto *et al.*, 2002). At this time, we did not look for specific terminology in the titles and selected those that indicated to include prescriptions and didactic-pedagogical orientation for teachers. Nevertheless, in the process of examining and photographic registration of the sources, it was also necessary to read their content, article by article, to establish the body of documents to be studied. The physical handling of the journals was important to find articles not identified by titles or author or that did not have a textual description. In this case, the choice of sources took place by the analysis of their content and form, which would not have been possible, if we had only read the titles presented in the catalog.

At first, we prepared a database using Microsoft Excel for each journal, containing: the year of publication; the year of the journal; the number of the issue; the page of the article; the section of the index/table of contents; the authors; the title; the content description; and the theoretical references used. Subsequently, we created a database for each journal using the IBM® Statistical Package for the Social Sciences SPSS® Statistics software — version 22, attributing variables to this information, so that we could cross them.

The use of this program, as a tool to organize the sources, allowed a broad vision of the object of research, given that, considering the large number of articles and the long period of 29 years, it was necessary to cross the data. This helped to locate and manipulate the body of documents, and to understand the form and content of the sources.

We used the critical-documental analysis proposed by Bloch (2001, p. 79) as a reference, because it allowed us to read what is present or absent in the journals, after all, "[…] texts or documents, even the apparently clearest and most complacent ones, do not speak unless we know how to interrogate them". In this process, the journals were understood as artifacts with intentions, produced by individuals or groups who, at a certain moment, pointed to the theoretical bases that contribute to the insertion and consolidation of physical education in school curriculums.

ARTICLES THAT SUPPORTED PHYSICAL EDUCATION IN SCHOOLS: BIOLOGY AND PSYCHOLOGY

The discussions about the models of human formation based on eugenics and hygienism, as discussed by Cassani (2018), required "framing" physical education in the domains of general biology. To assure a scientific nature, the scholars writing and editing the journals dedicated to teaching and techniques, appropriated studies from the broad field of biology to prepare the specific theorizations of physical education. By delimiting their object of research to corporal exercises, these writers were steered toward "[…] the broad guidelines of modern biology, which also [maintain] articulation with other fields of knowledge, such as physiology" (Salzano, 1935, p. 7).

The rational character required of physical education conferred it the same milestones that "[…] indicated the limits of biological methodology" (Salzano, 1935, p. 7), committing it to studies focused on establishing relations between the various functions of man in motion. The scientific and methodical statute attributed to physical education would allow it to more deeply examine the reality of the human body, specifically corporal exercises, forming "[…] an approximate image to the truth but always an image and not reality itself" (Salzano, 1935, p. 7).

This finding, based on Whilhem Knell, would confer to studies of physical education principles that resembled knowledge originating from biology, nourishing science and the production of knowledge which was considered "positive" in problem solving. Physical education, thus, helped to respond to the questions raised in the broader field of biology.

Given these prerogatives, the dialogue of scholars with this group of sciences and its ramifications, such as anatomy, anthropometry, physiology, morphology, biotypology and biomechanics, organized and constituted the field of physical education, inserting it among educational problems. To consolidate this process, the use of the biological theories served to produce a "practical theory" of physical education, in which teachers would comprehend the "[…] influence that physical exercises have on the organism and the *quantities* and *series* that should be *applied*" (Salzano, 1935, p. 9, emphasis ours).

Gradually, printed articles began to circulate in the journals that developed a theory for physical education based on psychology, which was given the same status as biology. That is, for physical education to be rational, methodical and scientific, it was necessary to incorporate into the studies of the physical capacities all of the knowledge related to psychic capacities. After all, "[…] who [could] […] scientifically, separate one from the other?" (Olinto, 1933, s/p.).[3]

Something recent at the time, the appreciation of scholars of physical education of the human personality and of "[…] intervention from data of this science, in [its] technique and theorization" (Lourenço Filho, 1935, p. 1) was generated by the discoveries in the field of psychology on the totality of the human being. The expansion of the conception of the body, of its value and its relation with the spirit, sought to consolidate the inseparability between thought and action, between the actions of the body, the values of the spirit and its character. These principles were also assumed by physical education in its practices that appropriated psychological theories.

The dialog of the writers with these studies established the argument about the impossibility of the larger field of education being configured in isolated compartments, as if intellectual education and moral education were disassociated from physical education. Therefore, professionals who act with teaching gymnastics or sports, would also practice intellectual education by teaching the "[…] precision of movements, sharpness of reasoning and thus, moral education (acceptance of the rules of the game, with social understanding, emotional discipline, strength training, etc." (Lourenço Filho, 1935, p. 1).

3 The dialog with both biology and psychology also announced the strategies of the scholars to confer to physical education, and its insertion in school programs, a place of importance in the process of constituting the identity of the Brazilian people. Affirmations such as "[…] the time has passed in which the intention was to contrast physical and psychic exercises" (Olinto, 1933, s/p.) confirmed the need to understand the impact of physical exercises on the well-being of individuals and their sense of solidarity, awakening intelligence, improvement of morals, and elevation of "noble thoughts" among Brazilians. The life in society of youth would depend on their physical "efficiency" and from the values generated by exercises, they would learn to cooperate with others, and know how to win and lose honestly. Thus, the appropriation of psychological theories also had the objective of giving value to the action of physical education teachers as those who by "[…] expanding their range of action in assistance of the formation of Brazilian youth" (Raposo, 1957a, p. 5), would exercise a fundamental role for students to develop values, by means of which they would face daily problems.

For Lourenço Filho (1933), the didactic organization of the disciplines among those of an intellectual, moral and physical nature did not mean that they should be disconnected. In this way, the circulation of psychology theories in printed journals helped to have educational processes to be intrinsically understood as thinking, feeling and acting, conferring a similar importance to physical education and the other disciplines in the process of integral formation of subjects.

BIOLOGY AND PSYCHOLOGY: THE PLACE OF EXPERIENCE, DEMONSTRATION AND METHOD

Articles like those by Hollanda Loyola (1940) expressed how the study and observation of knowledge of different functions of the individual involved the definition of a method that best applied exercises to the human "machine". That is, the appropriations of the theories of biology allowed, in physical education, to attest to the reliability of a method for the systematization of rational practices. The author discussed the need to create a physical education method for Brazil, based on an analysis of the physiological principles of the methods that he considered the most promoted in the country at the time — the Swedish Method, Calisthenic Gymnastics and the French Method.

To do so, a curve of the effort expended to execute a lesson was used, as it demonstrated its degree of physiological rationalism. Loyola (1940) justified the option to investigate the amount of energy required to execute the methods, for it was more relevant than the diversity of the exercises employed. In his view, if this type of analysis was not made, men would be submitted "[…] to violent exercises [with] grave consequences for their functional equilibrium" (Loyola, 1940, p. 12).

Specifically in relation to calisthenics and the French Method, the author compared the physiological guidelines present in both, to discuss the development of an eclectic, rational and scientific method in Brazil, as seen in Figures 1 and 2:

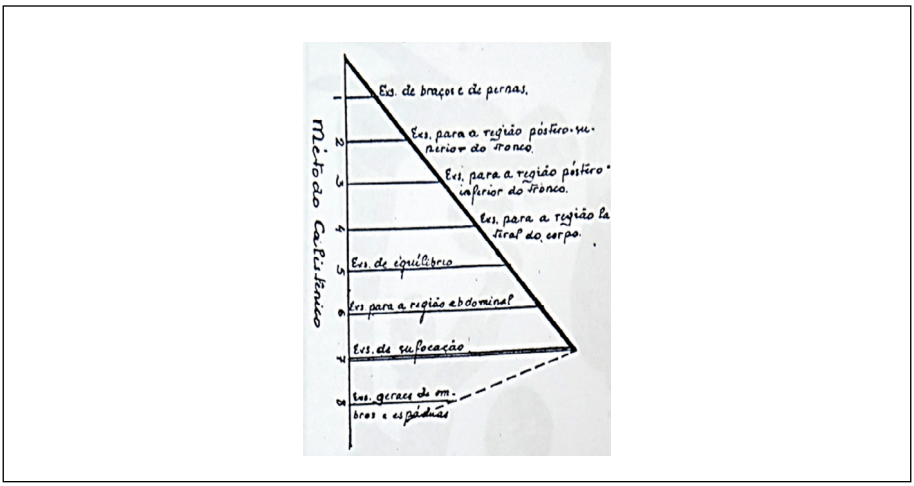

Figure 1 – Physical effort curve in Calisthenic Method.
Source: Loyola (1940, p. 13).

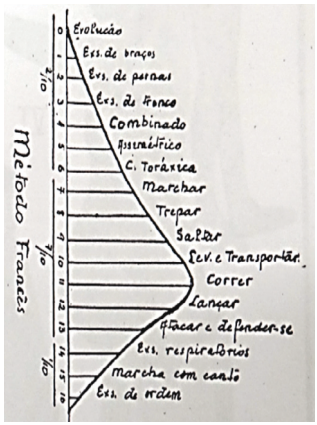

Figure 2 – Physical effort curve in French Method.
Source: Loyola (1940, p. 13).

Figures 1 and 2 represent the physical effort in performing calisthenics exercises and the French Method. The author's criticism of calisthenics refers to the violent form with which the gradation of movements was developed: beginning from group 1 (arms and legs exercises), it rose rapidly to the peak of the lesson, found in group 7 (exercises that involved holding the breath), descending abruptly to group 8 (general shoulders and shoulder blades exercises). For Loyola (1940), the image demonstrated that, in relation to the physiological principles, there was no prior preparation for making great efforts to warm up the organism.

Meanwhile, regarding the effort curve of the French Method, Loyola (1940) affirmed that it was the most rational among the methods analyzed in his study. Its lessons consisted of: warm-up exercises (from evolutions to chest exercises — 1 to 7); a slow and continuous gradation to maximum effort, expressed in running (12); and the realization of warming-down exercises causing the student to return to their initial state (15 to 17). There were no sudden or violent oscillations. The entire lesson was made with normal physiological gradations.

Loyola's study (1940) was inserted in a situation of tension on the institutionalization of the French Method as the one officially adopted by the government.[4] Amid these struggles over representations (Chartier, 1990), the author's analyses sought two actions in that context:

4 This is the study *Réglement Géneral de Éducation Physique" (Méthode Française*, created by the Escola Normal de Ginástica e de Esgrima de Joinville-Le-Pont (France), in the 1920s. It was published in 1934 (Estado-maior do Exército, 1934), and became a guide for physical education in all the units of the Brazilian army, including at the Escola de Educação Física do Exército [Army School of Physical Education]. In 1937, regulamento n. 7, was officially declared the method that would support the teaching of physical education in high schools.

1. to convince teachers about the best method to be used in physical education classes, given that without these principles, everything would be "empirical, artificial"; and
2. to strengthen the importance of scholars taking on the principles of physiological gradation and continuity created by the French School, to develop a method of their own.

The French Method would be a guide to orient the creation of a future Brazilian method.

Also based on studies by the Army, First-Lieutenant Rocha (1941) affirmed that, among the problems to be resolved by physical education, there would be no place for improvisations and exaggerations, because the knowledge of physiology offered the bases for rational training, in a progressive adaptation of the organism to a certain work. Moderate muscular exercise, in doses based on the physiological capacity of the students, would improve their coordination faculties, and would ensure savings in physiological expenditures, offering maximum range to the possibilities for execution of movements.

The analysis of the sources revealed that the circulation of theories of physiology presented different purposes that supported each other: articles, like those of Salzano (1935), justified the scientific study of bodily exercises, according to the precepts of biology; and publications, such as those of Loyola (1940) and Rocha (1941), appropriated these guidelines to show teachers how they should organize their pedagogical practice. These proposals for physical education were based on the scientific practices of biology, in which methods of *observation* and *experimentation* were used to deepen understanding of the objects of research. These methods were used to establish physical education as a science, by creating a theoretical-practical framework to guide the performance of teachers. The effort of the writers was to produce and validate knowledge of a scientific and rational nature:

> The adoption of this principle naturally implies the choice of suitable exercises, and the definition of a purpose to be attained, which through the practice of physical exercises, supported harmonic development of the body, the correction of form, the equilibrium of organic functions and utilitarian preparation for a productive life. (Loyola, 1940, p. 13)

Concomitantly with the studies of physiology, scholars appropriated the foundations of anatomy, as they allowed appreciation of the "exact and true" proportions of human movement (Canessa, 1944). It was understood that it would be unacceptable for teachers to orient, direct and administer their classes without mastering the theories of human structures and functions. The modern concepts of anatomy would provide teachers knowledge about the human being as a complex, inseparable and dynamic whole "[…] from a global perspective […] as a variable and influencial structure, an object and end of education" (Canessa, 1944, p. 14).

The presentation of studies of anatomy in the journals assured the understanding of the "human motor", so that teachers would act rationally in the

educational processes. To achieve "efficiency" in the teaching processes, the writers attributed to the journals a role similar to that of educational courses in physical education, presenting theories that would guide the pedagogical practice of teachers and instructors (Azevedo, 1937a). To provide teachers "complete and efficient" knowledge, the journals encouraged them to study these theories and perfect them by practice, as seen in Canessa (1944).

To guide professionals who worked in physical education, the writers published articles based on knowledge of anatomy, showing them how these theories addressed the structures involved in the mechanics of the movement, that is, the realization of the exercise itself. These theories were materialized in reading devices present in articles that sought to prescribe teaching performance and guide professional education, as demonstrated in Figures 3 and 4.

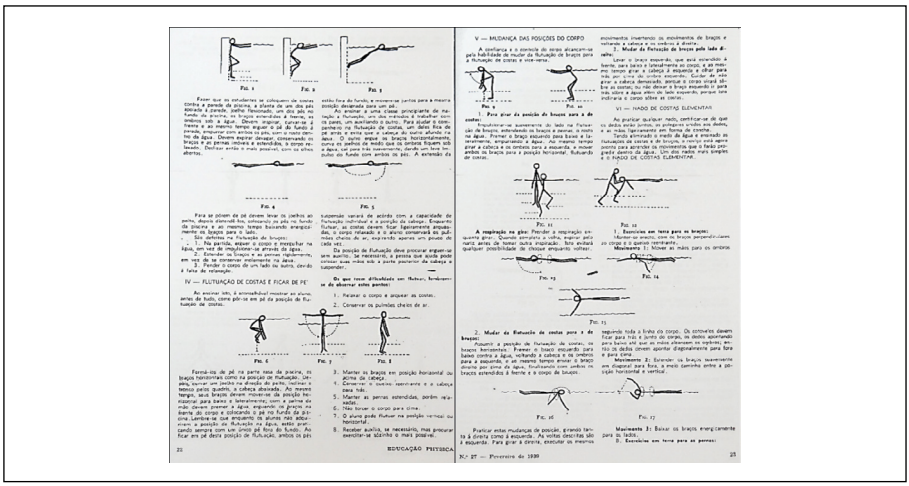

Figure 3 – Elementary swimming.
Source: Goss (1939, p. 22-23).

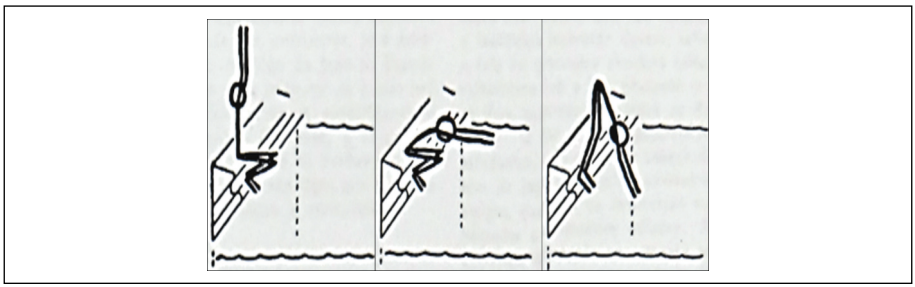

Figure 4 – Teaching elementary swimming.
Legend:
[...] explain [to students] that before entering the water they should *inspire*; when they are falling they must *hold their breath*; and when they come back on the surface they can *expire* vaguely.
B – Plunging into the water. Sit on the edge of the pool. Put your feet in the drip. Knees apart. Bend ahead over water, until the fingers almost touched the water, then fall causing the hands to enter the liquid first, and the whole body in a straight line.
Source: Goss (1939, p. 27, emphasis ours).

Figures 3 and 4 refer to an article signed by Gertrude Goss, author of the book *Swimming Analyzed*, edited by A. S. Barners (New York), one of *REPHy's* collaborators. In it, the author presented "experience-based principles" to progressively teach "rational and efficient" swimming. The technical details needed to carry out the basic elements of the modality, such as eliminating the fear of water, breathing and relaxation, floating and changes of positions of the body in the water, were described with text and images. The designs were numbered and accompanied the written narrative, that is, they were incorporated into the text, so they did not need to be mentioned in the text.

Meanwhile, an article by Rezende (1932) sought to promote basketball and, to deconstruct for readers its "extreme" complexity "at first sight", by showing its "component parts": ball handling, passing, shooting, running, jumping, individual skills and defense. Figures 5 and 6 refer to this article.

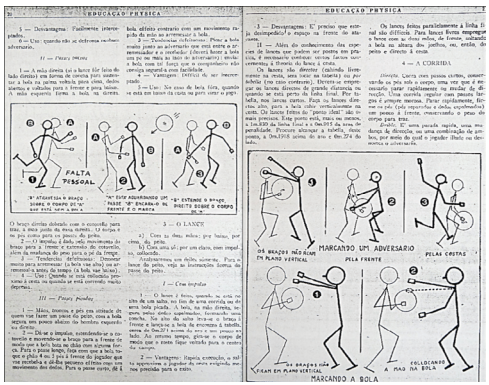

Figura 5 – The "ABC" of basket ball.
Source: Rezende (1932, p. 20-21).

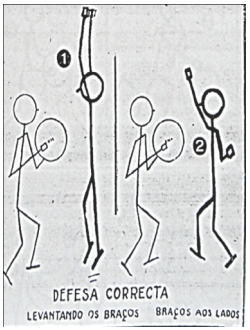

Figura 6 – The "ABC" of basket ball: defense.
Legend:
"Open arms, ready to get down or get up; erect trunk, feet apart; slightly bent knees. Be ready to jump if the pass comes high. […] 2 – Use.
Make your opponent's move harder and, if possible, intercept".
Source: Rezende (1932, p. 23).

To demonstrate its "remarkable simplicity" the author textually described how to conduct the specific movements of basketball, the important points to be observed, as well as misleading trends, clarifying when to use these different "component parts", always accompanied by images, as seen in Figures 5 and 6.

In both articles (Goss, 1939; Rezende, 1932), the teaching of the exercises was based on the principles of modern science required by physical education, in which the production of "true" knowledge was based on rigorously demonstrated experience and facts. Similar to the fields of biology and psychology, what characterized physical education as a science was the use of methods to demonstrate "[…] the manner or order followed in search of something, […] to reach a desired end" (Raposo, 1958, p. 11). In these articles in particular, the use of the method was revealed by the effort of the authors to demonstrate, more clearly, in sequence and with precision, how to teach swimming and basketball, facilitating the understanding of teachers about the correct performance of the exercises.

The textual resources and images used by the authors also indicated the process with which intellectuals appropriated anatomical knowledge, in order to guide the practice of educating teachers. The uses of these reading devices, such as schematic diagrams, figures and photographs, were based on the theoretical-practical study of anatomy, as it considered these visual resources to be didactic materials and "valuable supports" for both teachers and students (Canessa, 1944).

Written statements were associated to these resources, which, for Canessa (1944), had consecrated and particular value in anatomy. They recorded the fundamental anatomical principles and predated any visual device used to support the teaching and learning processes. Likewise, in order for this knowledge to be appropriated, inscribed in statements, it was necessary to broaden them to other methodological procedures: "[…] acquired in a certain manner theoretically, [this knowledge] should be made objective through an opportune graphic scheme that clarifies and fixes the description" (Canessa, 1944, p. 17).[5]

The designs used in the articles, in "clear, simple and precise lines" were considered by Canessa (1944) as one of the most important resources for teaching anatomy and its application in teaching physical education. Design was the best tool "[…] so that what becomes weary to the ear is distracted by the eye, which is the way to make it more interesting" (Canessa, 1944, p. 18), avoiding that they escape details in the process of observation of the human functions.

This concept of modern science sought the detailed study of segments of the human body, in order to "elucidate" the complexity of corporeal exercise and to clarify all doubts regarding its correct realization, since all the designs were presented only by lines — which represented the joints and muscles used for that action. It was through design that there was understanding of the totality of the phenomenon

5 According to Canessa (1944), advances in cinematographic arts helped to apply as a didactic resource for teaching anatomy, which also supported the use of images to guide the teaching practice in the physical education journals.

studied and the knowledge on the human form itself was demonstrated, provided it was represented "easily and in detail".

From the perspective of psychology, the articles that guided teaching materialized principles discussed by Freitas (1938), such as *observation and precision*. For the author, *observation* was the *action* of sensorial attention. It allowed the "spirit" of the reader to focus on objects and people, on a detailed examination, whose purpose and essential quality were *precision.* In the same way, *memory* (motor and intellectual) would provide the bases for the precise sequencing of the movements, guiding the entire progress of the exercises.

Whether by the content or form of the articles, the concepts of *observation, action* and *memory* were mobilized by the journals to offer fundamentals of psychology to the didactic principles of physical education, contributing to its use in schools. The teaching and learning of sports, gymnastics, games and dance involved considering all of the knowledge produced by *observation in action* of spaces, movements and devices needed for their practice. This *precise* definition of the specificities of the physical exercises formed the bases for a scientific discipline, that would include objects of teaching to be treated in depth. Gradually, the teaching processes became more complex, using as reference the memory of previous learning.

In this way, the journals presented themselves as didactic-pedagogical materials for guiding the learning of teachers, who would use their memory to "repeat" the movements described in the articles, whether by text or images. At the same time, the journals would support their teaching practices, given that in classroom situations, teachers would also use their memory to teach students to progressively perform the exercises.

A research by Retz (2019), which analyzed the use of images as editorial strategies to guide the pedagogical practice of physical education teachers in these journals (1932–960), also understood that these images would become devices for "modelization" of reading (Carvalho, 2006), whose proposal was to support the training of those who taught physical education based on the idea of doing to learn and learning to do (Ferreira Neto *et al.*, 2014). That is, teachers should also be good at executing the exercises, so that they could teach them. Thus, the observation of the images in articulation with the written texts would provide models for readers to appropriately embody the exercises. In this case, the images were part of the editorial project of these journals and had the purpose of teaching physical education in schools.

Essential to making concrete the principle of memory, the *Law of exercise* called for the repetition of exercises by students, so that learning processes would make it easier to "react" according to the specifics of movements (Sharman, 1939a). All learning was a reaction and all things were learned by doing them, whether motor skills, mental and emotional lessons, or moral procedures (Sharman, 1939b).

The act of learning, in this case, was imperative, because to study the set of exercises that constitute physical education, in "[…] countless lectures about the values and techniques of sport *would not establish* the desired reaction. […] the greater the reaction is practiced, the more careful, ready, easy and precise it will be" (Sharman, 1939a, p. 12, emphasis ours).

Specifically, the article about teaching elementary swimming, in Figure 7, also shows us the appropriation of the *Law of the effect*, discussed in psychology. The procedures taught in the article precede the orientations found in Figure 4, about the correct way to breathe in a liquid environment. The articulation between the figures point to the use of the referred law in teaching and learning in physical education.

Stand flat on your stomach with your face under water and your hands down. To breathe in, inhale through your nose and exhale through your mouth.

While the left arm pulls deep into the water, the head turns to the left. The stroke ends at the height of the chairs [...].

The head is thrown back while the swimmer exhales through his nose. The left arm begins to return to the starting position, lifting the top and pointing the elbow up [...].

Figura 7 – Lesson for teaching the crawl stroke.
Source: Crabbe (1934, p. 50).

The purpose of the material in Figure 7 is to propose a lesson for teaching the crawl stroke, authored by Buster Crabbe, swimmer and Olympic champion. In it, there are textual statements that led the reader to the *how to do* of the movements registered by the photos, in which the author simulated being in a pool to teach the technique of crawl swimming. The photographs in Figure 7 also use arrows to show, with greater precision, the exercises to be conducted with the arms and trunk, assisting the understanding by physical education professionals.

The lesson also made explicit how the didactic-pedagogical nature of the journals allowed them to circulate and be used in an agile and precise manner by readers. As a support material of just a few pages, when compared to a book, the journals could be used daily, in different places. With clear and illustrated literature, the journal would take on the role of a advisor even before the practice of the lesson (at school or elsewhere). It was necessary to observe it carefully so that teachers could later practice "[…] on a small bench with these photographs in front of them" (Crabbe, 1934, p. 51). Thus, the study of physical exercises and their corporal enactment would precede the teaching itself.

The orientation to use a bench, when teaching swimming, also established the journal as a didactic material, with two intentions: for its materiality and for its content; and by indicating paths that would facilitate the processes of teaching

and learning, suggesting the use of other didactic-pedagogical resources, in this case, a bench.

Figures 4 and 7 highlight the need for students to practice correct inhaling and exhaling in swimming as these are the basic principles for the entire process of learning the modality. Breathing correctly, that is, with one's head tilted to one side, would allow attaining levels of satisfaction and positive experiences such that students would be motivated to seek similar reactions. The instructions urged avoiding inhaling with the head immersed in the water, because the results would lead to unpleasant reactions to students, discouraging them from learning to swim.

These causality relations, developed in the field of psychology and appropriated in physical education, sought to create methodologies that, under certain conditions and circumstances, would assist teaching and the actions generated from it. With a focus on the learning processes, the work revolved around the development of students who want to act in a certain manner. The article in Figure 7 refers to the need for students to attain sufficient breathing ability in swimming, therefore, the concept was expanded to the learning of other exercises, by means of which students would acquire the *state of readiness* and the desire to realize the same technique many times.

In this case, the appropriation of the law of cause and effect would confer methodological rigor to the teaching processes and to the learning of physical education, as would occur in scientific practices considered modern. Through it, didactic procedures were developed that focused on situations of *incidental satisfaction*, sufficient to motivate learning. As Sharman (1939a, p. 13) states, "[…] teaching situations should be planned so that students can attain success satisfactory to a reasonable effort. If someone always fails, they [either] become discouraged [or] stop trying".

Therefore, it was necessary to know the biological and psychological characteristics of the students, in order to properly dose exercises and lead them to appropriate and pleasant reactions. As an effect of these initiatives, an "efficiency" was noted in the teaching processes as well asimprovement in learning results, which are "[…] assured when a student, driven by intense desire or precision, has the opportunity to correctly practice an activity so that it provides great satisfaction" (Sharman, 1939a, p. 13).

To provide the tools needed so that teachers would promote the development of the learning by students, considering these specific laws, the writers published articles that were focused on *precision* in performing the movements, The details with which they addressed the different activities showed how the dialogue between biology and psychology would allow the creation of different teaching methodologies in physical education. Figures 8 to 13 support this analysis.

Figures 8 to 13 refer to articles whose purpose was to teach teachers: javelin throwing, track and field (Figures 8 and 9); how to swim the backstroke (Figures 10 and 11); and certain baseball plays (Figures 12 and 13). Weldon (1940) presents detailed descriptions of the movements and their correlation with the images, all

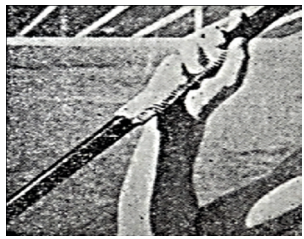

Figura 8 – Dart handling.
Source: Weldon (1940, p. 23-25).

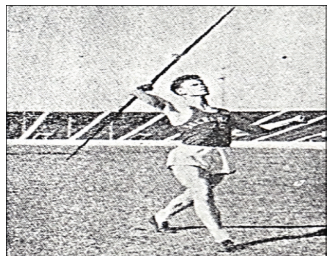

Figure 9 – Dart approximations.
"In this mode of holding the dart, the launcher holds it over the top, so that the middle finger contains an arrow. [Mills brings] the javelin to his back. He keeps his shoulders regularly raised, if you turn slightly then".
Fonte: Weldon (1940, p. 23-25).

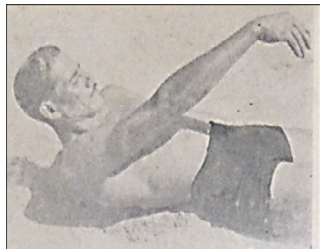

Figura 10 – How to swim the backstroke.
Source: Lima (1942, p. 15, 16).

Figura 11 – How to swim the backstroke.
Legend:
"When the arm is extended along the body, the movement is initiated by raising the arm in the front plane. […] the arm starts to move outwards and backwards, until the hand reaches a position just beyond the head".
Source: Lima (1942, p. 15, 16).

Figure 12 – Baseball: how to perform the *bunt*.
Source: Paraense (1949, p. 17).

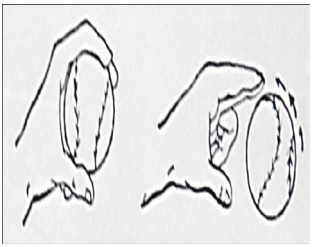

Figure 13 – Baseball: how to hold the ball.
Legend:
"How to hold the ball in a good throw".
Fonte: Paraense (1949, p. 17)

enumerated throughout the text. In Lima (1942) and Paraense (1949), the photographs and drawings were not enumerated and were not used as references, since they were incorporated to the texts. In all figures, the sports were practiced outdoors, suggesting that the hygienic principles were appropriated by the scholars to guide the teaching of different exercises, not only those in which there was an indication of the doctrine mentioned.

According to Cassani's (2018) study, hygienism was presented in the journals, providing the basis for physical education to be performed outdoors and in a natural manner. As an educational project, it focused on the physical health of human beings, as well as the quality of "spiritual health". According to this concept, the well-being of the spirit was not a means to "physical health" but an end in itself, through a reciprocal influence between body and spirit.

Under the foundations of science, hygienic education sought to correct "[…] organic weakness, [to produce] symmetrical figure, [develop] muscles, [dilate] the thorax, [increase] vitality and strength, placing health on a firm pedestal" (Educação hygienica do povo, 1938, p. 9). Physical education would develop the physical vigor needed for the balance of human life, the happiness of the soul, seeking the preservation of the country and the dignity of the "species" (Educação hygienica do povo, 1938).

As with the article referred to in Figure 7, the backstroke was proposed to be taught in a space other than a pool. The sources point to a specific didactic for swimming, in which exercises were first perfected in environments that could help prepare

students for direct contact with water, which in turn contributed to their learning process. The recommendations of both sources show us didactic and methodological processes in which teaching would take place in more simplified environments, to be gradually experienced in real situations of application. Meanwhile, the analysis of the articles also suggests that, for hygienic purposes, swimming should also be practiced on rivers and beaches, as seen in Azevedo (1937b).

Being sports whose main action requires handling equipment and arm movements, the javelin throw, swimming and batting in baseball (Figures 8 to 13), the authors emphasize exercises with these "corporal levers" in different ways: through the (in)correct way of handling the equipment, as well as the position of the hands and the movement of the shoulders and arms. They studied each one of the major functional regions of the upper limbs (shoulders, elbows and hands) and, progressively, the behavior of all the other body segments, so that the main actions could be conducted. This form of addressing sports revealed the authors' dialogue with the didactics of anatomy, which emphasized the need to study the partial sets of the body, understood as "[…] centers of interest or partial problems, within the set appreciated globally in principle" (Canessa, 1944, p. 21).

In this case, there are different uses by the writers regarding the content of the articles, specifically about anatomy. In articles that discuss theoretical bases, we see detailed work to demonstrate the structures of the body segments (in their skeletal and muscular systems). Meanwhile, in articles focused on providing supports for the intervention of teachers, in class situations (Figures 4 to 13), this knowledge was mobilized and appropriated for work with technical specificities of different physical exercises. Thus, the publications about anatomy were needed so that teachers would first learn anatomical theories as well as the didactic processes based on them. Later, readers would understand the bases for the correct performance of the exercises.

We understand that the appropriations of the writers of the method based on *body leverages* were used and expanded by the studies of psychology, which focused on improving learning through *complete units*. Based on the principles of anatomy, the articles of a didactic-pedagogical nature presented the structures of the body segments in detail, in order to show teachers how to work with the technical specificities of the exercises. Based on foundations of psychology, these techniques and abilities would be better grasped by students, if practiced as a whole. In this case, learning to throw the javelin meant conducting movements of the articulations of the shoulder, elbow and hand, as if it was a single skill — in a more economical and effective action than if they were learned in small parts.

This form of learning by *entire working units*, involved considering that for nearly all the types of motor or intellectual learning, subjects would "penetrate" better in students' memory through the use of the *integral method* of learning "[…] than by doing so in parts to later group them and form the whole" (Sharman, 1939b, p. 9).

The examination of the specific *body of documents* related to psychology points to the need to incorporate theories, such as that of *concomitant and associated* learning, into the methodological procedures that sought to teach about the body "levers". The interpretation of the articles signed by Weldon (1940), Lima (1942)

and Paraense (1949), through a dialog with Sharman (1938a), makes explicit the contributions of psychology to the students' learning processes, discussing the need to know their interests and providing the means for it.

According to Sharman (1939a), based on the ideas of William Heard Kilpatrick,[6] students will always add other learnings to the first "things taught". If there was progress in the skills and techniques learned, students would demonstrate greater development and fluidity in their movements. Thus, the objectives determined *a priori* can be attained, making the teacher's educational practices successful.

This process was understood as *primary learning*. Based on it, students could "imagine" the processes of manufacturing equipment (such as javelins, balls and bats), the quality of pool water and the quantity of chlorine used. Although important, this *associated learning* did not mean specific advances in the skills of javelin throwing, handling the baseball bat or swimming a particular stroke (Figures 8 to 13).

In addition to these experiences, students could demonstrate attitudes articulated with the first actions taught. These *concomitant learnings* were as necessary as the *primary learnings,* as they expressed the behavior of students in relation to other people, their principles and their ideals, and were thus of great importance to education. To encourage *concomitant learning* among students, it was up to teachers to broaden their teaching methods, strengthening the "[…] simultaneous learning and [their role] […] in shaping them into firm and desirable attitudes" (Sharman, 1939a, p. 13).

The analysis of the sources allows us to infer that, at the time, psychology theories circulated that attributed to teachers the role of controlling learning processes, such as the *law of causality*, according to which learning by students always responded to external stimuli. In this case, teachers are understood to be responsible for making the experiences of students always favorable, in order to attain satisfactory results, which would nourish their interest in improving their current motor skills. This is the case of methodological procedures that were prescribed in the journals, such as the "skillful and rare demonstration of the teacher" encouraged by studies of psychology (Sharman, 1939b), stimulating students to always be interested in further progress.

It is necessary to recognize that various psychology theories were presented in the journals and at times there were tensions between them. While Freitas (1938) and Sharman (1939b) understood that teachers should be able to execute physical exercises with excellence, so that students could master them, Raposo (1957b) and Ramos (1936) show that there was no consensus regarding this practice.

Raposo (1957b) questioned studies based on biological determinisms. He referred to the *laws of causality,* which affirmed that human dynamism is defined *a priori* by physiological principles. *Corelated* studies, on the other hand, did not allow considering general biological traits as a starting point for understanding the constitution of character, but also recognized that the environment could "[…]

6 American educator, colleague and successor of John Dewey.

modify it, for better or worse" (Raposo, 1957b, p. 44). For Ramos (1936), *behavioral Psychology*, whose focus was on the "behavioralist formula S-R (stimulus-reaction)", was no longer sufficient to understand human reactions.

In this sense, Gestalt Theory showed that simple stimuli would not trigger simple responses in individuals and that, on its own, the process of stimulation-response did not explain the human psyche — which is constituted as an indivisible whole. It was the experiences and interests of human beings that shaped their global personality, and were responsible for "determining" a personal reaction to a future stimulus. Thus, associated to the behaviorist formula mentioned, "S-R", personality was also understood to function as an intermediary in stimulus-response processes (Ramos, 1936).

It is from this set of theories that emerged the need to understand the experiences that would favor the formation of students' personalities, so that teachers could contribute to the development of their positive valences (which would express a correct formation of behavior) or would foresee, ward off and avoid negative valences. In this case, students' demonstration of taste and motivation would offer clues to the correct biological and educational reactions, which would serve as parameters to identify whether the activities were suitable and corresponded to the interests of children and adolescents.

FINAL CONSIDERATIONS

The objective of this article was to analyze how writers for journals dedicated to teaching and techniques of physical education in the period 1932-1960 appropriated theories from biology and psychology. The analysis of the sources revealed that authors used a scientific perspective to insert physical education into the domains of general biology. In particular, studies of anatomy helped writers develop methodologies in the journals that better explained the objects of teaching physical education, presenting teachers reading devices that allowed them to, *precisely and truly*, see human movement.

The dialogue with biology and psychology showed readers the importance of knowing the students' characteristics, so they could properly dose exercises and steer students toward *convenient* and pleasant reactions. Specifically, the use of psychology would help systematize physical education based on learning experiences that were *always favorable*, attributing responsibility to teachers in relation to the outside stimuli that would encourage the students' interest in further progress.

In this sense, the uses of these theories also served as editorial strategies to insert and consolidate physical education in the curriculum, because, for it to gradually establish itself as a school discipline, the presence of teachers who taught through example and demonstration was essential to guide learning among students.

The analysis of the *body of documents* revealed that the journals dedicated to teaching and techniques were material supports with didactic-pedagogical characteristics, and whose purpose was to guide teaching practices and the training of professionals to work with physical education. From this perspective, *Revista de Educação Física* and *Revista Educação Physica* provided theoretical references that

supported the action of teachers, creating opportunities for conducting physical education classes.

In this case, it is the studies of biology and psychology that offered the bases to affirm that the development of physical education theories *always* implied practicing them. The sources indicated a *practice* that, in the journals, was intertwined with teaching and learning through direct experience with the exercises. Inserted in the project of integral formation of individuals, this *practice*, would create inseparable links between body, intellect and morals.

Therefore, we point to the need for studies that investigate the practices of appropriation used by the writers of the studies that supported the production and circulation of European gymnastic methods in the journals, given that they served to guide the pedagogical practices in physical education.

In addition, there is a need for studies that understand the theoretical perspectives and their materialization into criteria for the realization of homogenous groups and evaluative practices that were either prescribed by physicians or understood to be a responsibility of teachers. The background for this debate was the expansion from anatomical-physiological to bio-psycho-socio-philosophical theories, to establish the foundations for teaching physical education.

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