Review Article

GYMNASTICS IN PHYSICAL EDUCATION CLASSES: THE QUESTION OF WARM-UP

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ABSTRACT
The present study is committed with education and the organization of knowledge on Gymnastics in the school curriculum, and aimed to propose warm-up as a topic to be taught in Physical Education classes when Gymnastics is addressed. To consolidate the discussions, the development of the study was based on qualitative approaches, and surveyed information from literary review of the most varied sources and documents, analyzing the discourses of the texts and contexts contained in the theoretical productions on Physical Education. In conclusion, the theme of warm-up is studied by different professional areas, and there are controversies regarding its types, objectives and purposes. Therefore, the process of text construction committed with suggesting content for Gymnastics teaching contributed to the organization and systematization of knowledge in the area, and assists in the reformulations in the field of pedagogical intervention and methodological innovation in Physical Education classes.
Keywords: Gymnastics. School Content. Warm-up.

INTRODUCTION

This is a qualitative study about education, committed with the organization of knowledge on Gymnastics. It is part of a research project developed in the Center of Physical Education and Sports of the State University of Londrina, aiming to organize and systematize the contents of Gymnastics to be taught in Physical Education classes of Elementary School. It consists of a bibliographic research, having as basis knowledge historically produced in the area, toward presenting a reorganization and resignification of the contents to be taught in the formation process of children and youths at school age, in the different levels and modalities of education.

The contents to be taught in Physical Education classes need to have a transforming praxis, under the aegis of the paradigm of unit and complexity, in which body/sensitive and soul/intelligible, as well as theory and practice, are connected, aiming for the educative and formative processes of the human being, putting into perspective a cultured, critical and ethical subject. The edification of an authentic transforming praxis connected to the conception of human kinetics is viable, because through it we can contribute to the educative action, as Pereira (2007) defends.

When starting the discussions on the contents to be contemplated in Physical Education teaching, it is worth elucidating that content is the selection of cultural forms or knowledge, concepts, explanations, reasoning, skills, languages, values, beliefs, feelings, attitudes, ways of conduct and of procedures, among others, whose appropriation is fundamental to the education and formation of a person (COLL et al., 2000)

It is necessary, then, to expand the conception of content and consider what is relevant to apprehend in Physical Education classes in the school. It is understood that all structuring contents of Physical Education have to be taught at the same proportion. Structuring contents are "[…] knowledge of great amplitude, concepts, theory or practices, that identify and organize the fields of studies of a school subject, regarded as fundamental for the comprehension of its object of study/teaching." (PARANÁ, 2008, p. 25).

The school subject Physical Education will have as its structuring contents the fields of studies translated in sports, games and plays, gymnastics, fights and dances, besides historical knowledge produced by the area throughout the times. From the structuring

contexts, basic contents are organized, to be taught per grade or school cycles, two months period or semesters, composed of more specific themes/topics.

The teacher, when proposing the contents based on an expanded perspective, can appeal to questions that refer to the quest for the sense and the meaning of Physical Education teaching in the school. Thus, there is the question: what should students know? What should they know how to do? How do they have to be? What will students do after appropriating knowledge? In teaching-learning processes, the questions mentioned are dynamic and interact with each other within a network of complexity and totality, inside and outside the school.

It is necessary to stress that not every cultural knowledge and forms of our patrimony are present in the school curricular contents. It is known that throughout the history of Physical Education certain types of structuring contents, such as sports and games, had permanence at a greater proportion in the curricular proposals, to the detriment of other structuring contents, like dances, fights and gymnastics.

This work defends the possibility of teaching gymnastics in Physical Education classes with all the other structuring contents of this subject, such as fights, dances, sports, games and plays. There is some concern of the researchers of school gymnastics with legitimating it as a content and with identifying the knowledge necessary to the professional activity (RINALDI, 2005; ALMEIDA, 2005).

The effort is made toward consolidating gymnastics as a structuring content of Physical Education classes, and not only considering it as a supporting element for sports. Gymnastics, when approached in Physical Education classes of Elementary School, traditionally appears as a set of exercises for warm-up (stretching), before the practice of sports. It is also used in the end of the class, as a set of exercises for relaxation. This content of Physical Education is limited to serve as warm-up in the beginning of classes, or relaxation in the end, taking sports as a hegemonic content (NEGRINE; GAUER, 1990; CESÁRIO, 2001).

Gymnastics is a classical knowledge of the area; therefore, its presence becomes necessary in the school context, having the objective of offering knowledge historically produced that can contribute to the formal education of students. In this dimension, from the reference of gymnastics as a knowledge socially constructed, there is the question: Can warm-up be a part of the basic contents to be taught in gymnastics classes, within the Physical Education context? What should be taught about warm-up?

This study aims to help gymnastics to advance from its reduced condition as a support in sports to a structuring content, in which warm-up is a constituent basic content, a theme/topic in the educative process. The effort is made toward fostering the initial discussion among teachers, in order to produce knowledge that promotes possibilities of intervention in the school reality.

THE PATH WALKED

This study is characterized as a qualitative bibliographic research that, according to Marconi and Lakatos (2001), comprehends a bibliographic review published about the theme studied.

In this case, the bibliographic study has as purpose the direct approximation with what was produced about: a) the questions of gymnastics teaching in schools and b) warm-up as one of the themes/topics to be approached in Physical Education classes.

The present bibliographic research was not limited to the simple repetition of what has already been published about the subject, but it enabled the examination of the theme under a reflexive and propositional aegis.

According to Marconi and Lakatos (2001), the bibliographic research comprehends eight different phases, namely: the choice of the theme; the preparation of the working plan; the identification; the localization; the compilation; the annotations; and, finally, the composition.

Even though this work is part of a broader study, all phases mentioned by the authors were fulfilled during its development.

The problem of this study emerged from discussions made by students and teachers, members of a gymnastics workgroup linked to the research project "Organization of knowledge on gymnastics"'. In the discussions of the group, what generated the research in question was the scarcity of publications on the theme *warm-up*, associated with the difficulty in conceptualizing what warm-up is, its purposes, types, and what movements in gymnastics can be performed as warm-up.

After the delimitation of the problem and of the objectives, the members of the workgroup made an effort to conduct a bibliographic survey about gymnastics teaching in the school and the theme warm-up, finding works on the internet, magazines and online indexed journals, as well as on the collection of the library of the State University of Londrina.

Then, the phase of analysis and interpretation came, in which the criticism of interpretation or hermeneutics of the bibliographic material is carried out, considering a value judgment on a certain scientific material (RICOEUR, 1987). Thereby, the work was structured as follows: one part contextualizes the issue of gymnastics teaching in the school, and another one addresses gymnastics teaching related to theoretical aspects of warm-up.

WARM-UP: A THEME TO BE TAUGHT IN GYMNASTICS

The content to be taught was defined – gymnastics/warm-up –, but we understand that this or other content has to be related to the political-pedagogical project of the school, organized and systematized in the Physical Education curriculum, with teaching-learning purposes.

This article defends that gymnastics should not be used only for warm-up, that is, as a previous preparation for the body before the performance of sports or any other motor activity, but as a relevant theme/topic to be taught as a structuring content of gymnastics.

Teachers of the area, probably, have already been faced with some general questions referring to the theme addressed: What is warm-up? Is this terminology used in the area an adequate one? What are its purposes and objectives? For what does is it serve? What are the types of warm-up? Does the previous preparation of the body improve the performance of motor tasks? How long should warm-up last? What activities/exercises should be used? Is it really necessary to perform warm-up activities before motor exercise?

It is the responsibility of teachers who teach Physical Education classes in the different levels and modalities of education to teach what warm-up is, as well as its classification, purposes and objectives, the improvement it promotes in the performance of motor tasks, its duration and other aspects related to the theme. They have also to teach what activities and what exercises should be used before motor exercise, and orientate the best way of performing the movements, focusing simultaneously on the duration and relevance of the warm-up allied to permanent habits of practice of motor activities toward an active and healthy life.

The proposal of teaching something to someone implies an expanded conception about the theme, attributing to the teachers the responsibility in relation to the content selected for the school curriculum. In this direction, reflections about what, why, for what, how, when and who to teach are necessary for the teacher when it comes to the selection of school contents.

In a physical education class, the structuring content *gymnastics,* in which the topic is warm-up, means that warm-up is not only something to be repeated and imitated. Learning about warm-up is to apprehend the whole involving the theme in question, that is, concept/definition, purposes and objectives, practice and use, among others.

According to Pereira (2007), in an intervention process, teachers need to understand all things and all causes involving the phenomenon to be known and experimented, including aspects that spans from concepts and definitions to the execution of movements and perception of motor skills that involve the action. From that, we infer

that we can lead students to think over warm-up in its entirety. The complexity of the dialectic interactions of theorizing a given practice and/or of putting a theory into practice is considered, these aspects that imply processes of knowing, doing and reflecting about what was done.

The teacher has to develop an attitude of continuous quest for knowledge, explanation, comprehension and critical reflection. In the school sphere, for instance, we can ask: does a child, within an age group of 6-10 years old, need to warm-up? How does a child react in physical education classes?

It is known that in different environments and social contexts children naturally run, jump, spin, among other actions they perform. They present lower muscle rigidity, therefore, greater joint mobility and muscle flexibility. The joint mobility refers to the amplitude of movement of the joints and is manifested in different ways in children, adolescents and adults, and tends to decrease with age (LAMARI; CHUEIRE; CORDEIRO, 2005; GRAHAME, 2001).

One of the characteristics of the process of life is change, and in this natural cycle of growth, development and maturation, there are several phases: the newborn, child and adolescent, adult and elder phase. There is a continuous process of changes since conception until death (GALLAHUE; OZMUN, 1989).

Physical education involves children below 10 years old and over 17 years old. Tourinho Filho and Tourinho (1998), through their studies, demonstrate that, regarding the practice of physical activity, it is relevant that we consider the maturational and functional aspects of children and adolescents. According to Lazzoli et al. (1998, p. 107). "[…] there are particularities of the physiology of the exertion in children that derive from the increase in body mass (growth) and from maturation, which accelerates during puberty (development)."

Warm-up or any other motor task should be prescribed taking into consideration the morphological, physiological and psychological changes of each age group. In this sense, it is relevant to prioritize the biological age (that may be different from the chronological age), the gender, the muscle mass, and the aerobic and anaerobic power.

We need to watch out for the question of the population we teach. In infant education classes, maybe there is no need for intensifying the previous preparation of the body, of the warm-up, during class; however, warm-up for children can be carried out in days of low temperature, when teaching a certain content related to the practice of movements requires previous preparation, contrarily to what happens in days of high temperatures.

In classes for Elementary and High School, warm-up is recommended aiming for better motor and psychological conditions. Weineck (1991) explains that the intensity of the exercise and the duration of the warm-up have to change with age. The author also elucidates that in the school environment the duration of warm-up ends up reduced due to other specific objectives in sports teaching.

It is relevant to stress that, children and youths will be adults one day and will have to learn in the school questions concerning the previous preparation of the body, which will help them to perform motor tasks.

The organization of this theme/topic of warm-up into a unit of teaching becomes necessary, in a period pedagogically adequate to its learning and assimilation. Warm-up can be addressed in three or four classes, depending on the planning and the goals intended (COLETIVO DE AUTORES, 1992). Thereby, this basic content should be initially taught to students of Elementary School, and deepened in High School, because in this phase students can expand their knowledge about moving, relating it with the anatomical structures of the movement, as well as recognizing the relevance of the gymnastic contents for their lives.

DISCUSSIONS ON THE ELEMENTS OF WARM-UP

Warm-up

The name indicates action, the act of warming or warming oneself. The word, in Portuguese, derives from the Latin verbs "calescere", to warm, and "calere", being warm.

In the context of physical education, we are linked to traditions and nomenclatures in which the semantic analysis may not be totally coherent. Being warmed, with elevated body temperature, does not mean that some parts of the body are prepared for the performance of physical activities and exercises, that is, depending on the biological individuality of a person and the motor task to be performed, the body or some of its segments may need previous preparation.

Let us see an example: having ran 30 minutes at a moderate intensity does not mean to be prepared for a rhythmic exercise that requires the elevation of one of the two legs forward, at an angle of 180^{o} in relation to the leg that stood on the ground. Nevertheless, we can find people with elevated performance and capable of carrying out this solicitation mentioned without needing what we call warm-up or previous preparation. How many times do we not see people going for a jogging or running at a park without even remembering the knee and ankle joints?

The term warm-up, in the field of semantics, refers only to warming oneself, being warm, but traditionally, in the context of physical education, when used by teachers in their classes, is carried of senses and meaning, translated as previous preparation. Ferdinand Saussure (1986) explains that the conception of meaning is not limited to the questions of nomenclature of the language or of what the object means and brings as a reference, because the meanings, as such, refer to the structure of the language of a certain culture.

The benefits of warm-up

Warm-up is usually recommended before any motor activity, and its benefits are related to the preparation of a person in both the physiological and psychological dimension.

Warm-up is a transition phase from the rest state to the activity. It has the purpose of promoting the elevation of the central and peripheral temperature of the body, increasing the energetic metabolism, the cardiac output and the distribution of the blood flow, and decreasing the viscosity of the muscle-tendon system – of the muscle tissue and of the joints. (HAMILL; KNUTZEN, 2008; ROBERGS; ROBERTS, 2002; MAGNUSSON, 2000).

Although there are some controversies regarding the variables analyzed in the specificities of the studies, there are researches that argument in favor of warm-up, because it allows for the decrease in discomforts that may occur during the initial stages of an exercise program, enables the reduction of the risk for joint and muscle injuries and improves the efficacy of the movements (NICOLL et al., 2007; ROSA; MONTANDON, 2006; BICHOP, 2003b; SIMÃO, 2003).

The performance of warm-up favors the emotional side of the individual, that is, triggers a positive psychological effect, promoting a sensation of security, of "being well prepared" for the activity to be performed next (BICHOP, 2003 A-B).

There are correlations between warm-up and psychological state. When performing warm-up, a person develops "[…] a psychological state of promptness that provokes an ideal state of excitation of the nervous system, improving, thus, the concentration on the sportive development" (WEINECK, 1991, p. 439).

The types of warm-up

There are two forms of elevating body temperature: through passive warm-up and active warm-up.

Passive warm-up is the elevation of the body temperature with minimum energy expenditure. It uses a set of techniques in which the individual is subjected to external stimuli, like massage, electro stimulation, sauna, bath

of immersion into warm and hot water, hot-water bag, hot pad, small waves, and ointments, among others (WEINECK, 1991; ACHOUR JÚNIOR, 2004; DI ALENCAR; MATIAS, 2010).

In specific situations of practice of activities in cold days, the forms of maintaining the body warmed consist of wearing sweaters, coats, socks, gloves, sneakers and others. Clothing helps one to maintain his/her body warmed and, after the performance of warm-up, contributes to the prolongation of its effects.

Active warm-up is all body movements that precede motor activities, such as sports, games, fights, gymnastic exercises, gym activities, walking, running, rehabilitation exercises or techniques, that is, all preliminary movements of a certain exercise (WEINECK, 1991; ACHOUR JÚNIOR, 2004; DI ALENCAR; MATIAS, 2010).

As for the physical education classes, specifically in the school, passive warm-up is not usually experienced and experimented in practice, only the active one; but passive warm-up has to be taught and contextualized.

Active warm-ups can be classified into general or systemic (aerobic); muscle-joint warm-up (general joint mobility) and specific or special warm-up (for the practice of a very specific modality).

General or systemic warm-up

General or systemic warm-up is a type of active warm-up characterized by movements involving the body in a global dimension, and commonly uses synthetic exercises with aerobic characteristics. “Synthetic exercises consist of planned and organized movements for the human body and their execution affects the whole body, that is, present generalized action on the organism” (PEREIRA, 2007, p. 53). Synthetic exercises are global activities. An example can be the elements of basic forms of locomotion, such as walking, running, jumping, hopping, and others.

General warm-up affects the cardiorespiratory system, allowing for the increase in body temperature and heart rate, that is why it is also called systemic and/or aerobic warm-up.

The use of this warm-up in an isolated form may not be compatible with other possible demands of the class, such as, running moderately and subsequently starting more intense exercises in a volleyball game or a judo fight or, even, executing exercises of acrobatic gymnastics. It is relevant elucidating that in the sphere of the intervention, in the practical dimension, many times it is necessary to ally one or more types of warm-up, combining general warm-up with muscle-joint warm-up, or even specific warm-up.

In its restrict sense, general warm-up (systemic/aerobic) has as objective to promote the increase in the central temperature of the body, of the energetic metabolism, of oxygen consumption and of the heart rate. There is also the occurrence of elevation in the arterial blood pressure and the redistribution of the blood flow, causing the diffusion of oxygen in the muscles (NICOLI et al., 2007).

Warm-up through aerobic work uses submaximal exercises and/or activities, that is, activities of low intensity, for example:

- marching with or without varied movements of the arms;
- accelerated walking;

- running moderately;
- movements with displacement in various directions in the spaces;
- riding a bicycle;
- walking and/or running on treadmill; - skipping rope moderately;
- exercising short routines of aerobic gymnastics of low impact, combining movements of basic forms of locomotion, like walking, running, hopping, swinging, and others;
- transferring the body weight from one leg to the other.

This warm-up, in the context of the practice, should last between three minutes and around six to eight minutes, depending on the objective and duration of the class. It is important to be alert so that the aerobic activity does not turn into an anaerobic activity.

In the general warm-up (systemic/aerobic) the intensity of the exercises may stand between 60% and 75% of the maximum heart rate of the individual.

When speaking of duration of the warm-up, many variables should be considered, such as: schedule, room environment and climatic conditions, gender, level of physical fitness and the intensity of the exertion that will be required by the bodily activity to be performed – aspects that will not be discussed in this article.

Muscle-joint warm-up

Muscle-joint warm-up is a type of active warm-up characterized by movements that involve the body in a specific dimension and analytical exercises with predominance of joint movements. “Analytical exercises are planned and organized movements for the human body that, in their execution, affect certain parts of the body, acting on some specific muscle groups” (PEREIRA, 2007, p.50). Analytical exercises present localized characteristics. Some examples are the exercises destined to the segments; such as arms and trunk, the posterior part of the body and others.

The muscle-joint warm-up affects the articular capsule, and may favor the lubrication of the joints and the improvement in the capacity of absorption of impacts.

Usually, in the routine of physical education, and even in some magazines and websites about the area, there is the denomination “joint warm-up”; but it has to be clear that no joint moves isolatedly, but by interacting with muscles and ligaments. Thereby, it is evident that the term so often used is inadequate; for this reason, this study adopts the term “muscle-joint warm-up”.

In a restrict sense, muscle-joint warm-up has as objective, as the name itself indicates, the preparation of muscles and joints to support a more intense exertion and the increase of loads, optimizing the neuromuscular processes. Scholars of the theme in question (BICHOP, 2003a-b; MAGNUSSON, 2000) have observed physiological alterations derived from warm-up, because the increase in muscle temperature provokes the decrease in the viscosity of the muscle tissue and of the joints.

Warm-up, the same as previous preparation of the body through the movement of the joints and of the segments of the body, may have as a reference the mid line of the anatomical studies. Below there is the result of the movement of the body segments and of the joints based on the studies by Rasch and Burke (1977):

- as for the head, the neck allows its movement; the first cervical vertebrae, with the atlanto-occipital joints, allows the movements of forward flexion; abduction and adduction, extension; hyperextension; rotation and circumduction;
- as for the shoulders, the scapulohumeral joint allows movements of: elevation (movement toward a superior position); depression (movement toward an inferior position); rotation; protraction or projection (shoulders forward) and retraction (shoulders backward);

- as for the arms, the scapulohumeral joint allows movements of: forward flexion; vertical flexion; extension; hyperextension; abduction and adduction; internal, medial or proximal rotation; external, lateral or distal rotation, and circumduction;
- as for the elbows: the elbow joint allows movements of: flexion of the radius toward the humerus; semiflexion (90^o); extension; pronation (medial rotation of the fist or of the hand in relation to the elbow); supination (lateral rotation of the fist or hand in relation to the elbow);
- as for the trunk/vertebral column: it moves through compression and deformation of the intervertebral disks; the trunks executes the movements of forward flexion, extension, hyperextension, abduction and adduction; rotation and circumduction;
- as for the legs: the hip joint allows the following movements of legs: hip flexion, in which the femur goes 150^o or more forward; extension; adduction and abduction; hypertension; internal, medial or proximal rotation; external, lateral or distal rotation and circumduction;
- as for the knees, the tibiofemural joint allows movements of: flexion; extension; semiflexion (90^o of leg with thigh); rotation (together with the leg, with hip movement);
- as for the feet: the tibiotarsial joint allows movements of: dorsiflexion (foot flexion toward the anterior surface of the leg); plantar flexion (foot extension); eversion (ball of the feet outward); inversion (ball of the feet inward) and circumduction.

Movements of arms, trunk and legs swinging can also be used, in the sagittal, frontal and antero-posterior planes.

All of the joints should be considered, but the most requested ones may deserve special attention, in accordance with the objectives of the class. In this case, the focus is given to the muscle-joint warm-up, at the same time we approximate the specific warm-up, which we will study next. It is necessary to understand that the processes of intervention and operationalization of the activities are dynamic, and that, many times, we cannot carry them out in fragmented parts.

Let us exemplify what has been approached before: in a sportive aerobic gymnastics (SAG), a muscle-joint warm-up involving all joints can be performed, but there must be a greater emphasis on the hip, knees and ankle joints, since these joints are the most requested in a class that aims for the learning and enhancement of high kicks.

The duration of the muscle-joint warm-up in the context of the practice, that is, for a class in a school, has to be five to eight minutes, depending on the objective of the class.

Regarding the technique of execution of the movements for the muscle-joint warm-up, one has to be alert to some factors that influence the intensity of the activities or of the exercises, like the number of repetitions (volume), the number of joints involved, the speed of application (rhythm) and the use or not of materials.

The muscle-joint warm-up can be carried out through dynamic exercises of low to moderate intensity, with 16 repetitions or 30 seconds of duration. This work can use one or more joints.

Specific or special warm-up

It can be said that the specific or special warm-up is a type of active warm-up characterized by movements that involve certain muscles and joints, with analytical and/or synthetic characteristics, and can be performed with or without materials. In this type of warm-up, the body is prepared for more intense activities that will come next, whether in physical education classes, whether during training, whether also in a session of physical conditioning.

Weineck (1991, p. 434) explains that this type of "[…] warm-up is specific of the subject, that is, movements that serve to warm the muscles that are directly related to the sportive modality are executed".

The objective of the specific warm-up is to ally the previous preparation of the body with the enhancement of specific skills and capacities and/or techniques of a given modality that will be requested in the class, that is, to favor the previous performance of the specific technical fundamental of a modality in question – for instance, handball, artistic gymnastics, capoeira or others.

Scholars of the area (FIRMINO et al., 2005) explain that the specific warm-up increases the speed of contraction and relaxation of muscles and ligaments and increases the mechanic efficiency of the muscle contraction, due to the decrease in viscosity at cellular level. The warm-up also promotes […] improvement in the efficiency of the motor units that will be necessary later, increase in the blood flow across the active tissues through local vasodilation, accompanied by vasoconstriction of the inactive muscles" (FIRMINO et al., 2005, p. 26).

The exercises in this type of warm-up involve technical movements similar to those that will be used in the later activity with more extenuate character. These movements will have to be executed at low intensity and/or speed, with amplitude of movement in small and/or moderate proportions.

The following situation exemplifies the previous paragraph. In a class about the sportive modality rhythmic gymnastics (RG) with apples, we can perform a specific warm-up, using movements of circumduction of arms and fists, among others, starting with movement of small amplitude and with slow speed of execution, since the weight of this material is characterized as an overload.

Another example of specific warm-up related to volleyball teaching consists of performing movements involving all joints, with special attention to the joints of the fists, fingers and scapulohumeral joints, or also of starting a specific warm-up by using balls and movements involving the fundamental of the modality, such as bumps, touches and serves of low intensity.

The specific warm-up requires adaptation due to the specificity of the physical activity that will be executed next; for this reason, who uses this type of warm-up has already learned before the technique of the modality to be practiced. This type of warm-up is linked to the enhancement of certain techniques of specific movements. The benefit of the specific warm-up is that, at the same time the body is being previously prepared, certain techniques of movement are enhanced.

The duration of the specific warm-up in the context of the practice, for a class in a school, can range from five to eight minutes, depending on the objective of the class.

Stretching as part of the warm-up?

It is not the objective of this work to address with depth the theme of stretching, but we cannot disregard it because, in the context of physical education, stretching is often used as part of the warm-up process.

It is possible to observe in athletes and practitioners of physical activities the tendency to perform stretching in the first part of the warm-up, since the literature defends that static stretching is a moderate activity that promotes the efficacy in the gain of amplitude of movement. Thereby, these practitioners believe to be more prepared for the general and/or specific warm-up and for the exercises they will perform subsequently.

According to Achour Júnior (1998, p. 143), stretching exercises can be applied both in the first part of the warm-up or in the second part. This means that we can stretch before or after the general warm-up. The option depends on the level of physical conditioning of each person and of the objective of the training that will be performed later. For beginners and less experienced individuals, the author previously mentioned

recommends increasing the body temperature with active general warm-up and then using static stretching exercises, with light muscle tension, 01 or 02 series, between 15 and 30 seconds of duration. It is possible to see that the reverse also occurs, because people with excellent physical conditioning or athletes, if they perform stretching in the first part of the warm-up, will be more prepared for the general and/or specific warm-up.

Stretching exercises are classified into: a) static, b) ballistic and c) proprioceptive neuromuscular facilitation (PNF). As for the static stretching, "the muscle has its origin detached from its insertion until it reaches its limit of tolerance without the occurrence of compensations of adjacent joints, and this position is sustained for some time" (ROSA; MONTANDON, 2006, p. 104). According to these authors, this technique means a little risk for the muscle tissue, since it enables the accommodation of the viscoelastic properties of the muscle-tendon unit.

Nonetheless, in the ballistic stretching the technique of exercise involves oscillatory and rhythmic movements in which the muscle is led close to the extreme of its capacity of deformation and immediately returns to its original position. Rosa and Montandon (2006, p. 104) explain that the technique is functional, because "[…] in many cases, it simulates the sportive gesture to be executed. On the other hand, it may expose the muscle tissue to injuries. In this dimension, we can infer that the ballistic stretching could be used for specific warm-ups". It is observed that this is one of the controversial topics of the science of sports, due to the difficulty in assessing such stretching and executing a safe exercise program.

Finally, about the PNF stretching, Rosa and Montandon (2006) elucidate that this technique uses the principles of reflex inhibition and relaxation after excitation. In spite of the existing controversies in the area, studies point that, in general, the PNF stretching method is more efficient for flexibility gain.

There are studies that indicate using warm-up before stretching. Robertson, Ward and Jung (2005) argument that the increase in the intramuscular temperature favors a greater extensibility of the muscle-tendon unit, thus increasing the muscle amplitude of movement and decreasing the risk for injuries. This means that a warmed body, with higher intramuscular temperature, will be able to become more stretched and flexible.

In the scenario of production analyzed, it is possible to verify the existence of contradictions when it comes to this question. There are studies that do not recommend static stretching exercises as warm-up, especially for activities that demand strength and muscle power, stating that warm-up performed in great volume and/or with long duration may exert some influence on the development, since it may lead the muscle exercised to relaxation (FIRMINO et al., 2005; ACHOUR JÚNIOR, 2002).

Guiseline (apud BIDERMAN 2010) explains that a broader study about stretching, conducted in 2010 by *Track and Field*, a North-American governmental organization for running and walking, involved 1,400 people aged between 13 and 60 years old, and revealed that the number of injuries among those who stretched or not before running was statistically equal. The authors of the research stated that stretching neither prevents nor leads to injuries.

From the analysis made so far, it is possible to observe arguments favorable and contrary to the use of stretching as part of the warm-up process. It is worth considering that every motor activity is inserted into a planning in a given content, related to specific objectives and purposes.

We cannot affirm that stretching exercises do not assist in the warm-up, but neither that they are the solution for warm-up before any motor activity. The problem is that many Physical Education teachers take stretching as warm-up. Then, it is possible to conclude that stretching is not warm-up, but it can be a part of it, and its effect will depend on the type of situation of intervention of the training to be performed.

It is worth observing that the literature consulted clarified that warm-up and stretching are different procedural resources, have different purposes and objectives and should not be employed as synonym of the same practice.

For the intervention in the context of physical education, it is important that teachers have knowledge about the contents they proposed to teach, aiming to guarantee the quality and excellence in the exercise of their job.

FURTHER CONSIDERATIONS

This scientific work of bibliographic nature was consolidated from the knowledge already produced in the area; even though, the resignification and a new organization of the contents is predicted, for them to be taught in the process of formation of children and youths at school age. The answer to the initial question is that warm-up can be a content to be contemplated in gymnastics teaching in school physical education classes.

It is worth clarifying that the theme studied, as well as any other, has to be worked based on an emerging and complex paradigm. This means that the teaching of the content *warm-up* has to contemplate the human being in his entirety, and not only in his physical aspect, and has also to consider the sense and meaning of this content for his life. It is relevant saying that the teaching of this knowledge in the school needs to have as a goal the transmission of strategies for the lives of those who participate in this educational process. Then, the teachers has to deal with the content taking into account the learning linked to the formative processes of the human life.

This research verified controversies regarding the constituent elements of the warm-up: concept, purposes, types and movements. In spite of these controversies and the scarcity of material produced in the area, we suggest that warm-up should be taught in school physical education classes in the block of structuring contents destined to gymnastics.

The teaching of this content or of any other cannot be linked only to the learning or to the execution of technical fundamental, that is, it has to overcome the practical dimension, without abandoning it. Besides, it has to comprehend the theoretical aspects of the knowledge that is interconnected to the practical procedures, because we have to ensure to students the right to know the reason for learning a given content. It has also to consider the subjacent values and principles present in the teacher-knowledge and student-knowledge relationships, that is, what attitudes we should have during the teaching-learning process of the basic content *warm-up.*

In conclusion, physical education/gymnastics classes must consist of a space/time in which contents are used to educate people, that is, in which there is responsibility and commitment with teaching children and youths to move: move to know themselves; move to learn; move to participate; move to make ethical decisions; move to transcend and transform their lives.

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