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FACULTY OF PHYSICAL EDUCATION AND SPORT
THE DOCTORAL SCHOOL OF PHYSICAL EDUCATION AND SPORT**

SUMMARY OF THE DOCTORAL THESIS

***MODALITIES TO REDUCE COMPETITIONAL STRESS
AND ANXIETY THROUGH MENTAL TRAINING TECHNIQUES
IN BIATHLON ATHLETES***

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2018

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KEY WORDS: *anxiety, coping, motivation, performance, resilience, biathlon, self esteem, stress, mental training techniques in sports*

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1. Thematical frame of the doctoral work

As a branch of sports science and physical education, sports psychology is an interdisciplinary field and has a strong applicative side, with many "hard science" accents, involving scientific rigorous physiology, sports medicine, clinical psychology etc. (Gill, 2006; Singer, Murphey and Tennant, 1993). At the same time, it has taken over a number of concepts, theories and results of research in adjacent areas (sociology, anthropology, marketing), but has taken it selectively. Only part of the elements in physiology and anatomy are applicable to the area of exercise-oriented exercise and not all psychological approaches have direct application in sports. Researchers in the field of sport and physical education have applied selected theories, concepts and methods in classical scientific fields, adapting them to a niche of interest specific to their own area of concern, integrating information from different directions in order to develop specific theories, concepts and methods to provide an adequate knowledge of this science (Singer et al., 1993). In this respect, the theoretical realizations that are materialized by Martens' 70s and developed a few years later, dedicated to Competitive Anxiety Test (SCAT), which outline the importance of a specific sporting approach within a wider psychological framework (Martens, 1977, 1982, quoted by Martens, Vealey and Burton, 1990).

A *general definition of classical sport psychology* was provided by Diane L. Gill in 1986: "The Scientific Study of Human Behavior in Sport and Physical Activity." (Gill, 2006, p. 230). The European Federation of Sports Psychology (FEPSAC), positioning the status of this branch in the European vision and taking on the much more psychological orientation in the US on the subject, and on the basis of high-impact European studies of the 1990s (Biddle, 1995) , broadened the scope of the classical period, defining in 1996 the sport psychology as "the field that focuses on human behavior, including the affective, cognitive, motivational and sensory dimensions of psychology", and sport as "the physical activity framed in its parameters competitive, educational, recreational, preventive and rehabilitative, including health-related exercises. " (Gill, 2006, p. 230).

Thus, the psychology of sport addresses the actual sports practice, psychology and other sports sciences, and sports psychologists have three interrelated tasks: research, education and application (ibidem). Following the evolution of the area of interest in the field in the 20

years since the first definition, the quoted author offers a more comprehensive scope: "The psychology of sport and physical education is that branch of science of physical education and physical education involving the scientific study of human behavior in sport and physical activity and practical applications of this knowledge in sports and physical exercise facilities "(ibid., pp. 230-231).

But certainly the most advanced direction of sports psychology is *sports performance*, primarily because the amounts involved in this industry are significant, and secondly because, as a well-defined sector, systematic studies of great analytical depth. The field of performance sports is also bordered by physical education, adding valuable information and techniques to achieve the goals, where training psychology occupies a special place (a field developed by the well-known Griffith sports psychologist), competitive performance studies being increasingly laborious and extremely useful both sports coaches and psychologists (Andresen, 2001; Danish, 2001).

In order to obtain exceptional results, *psychological intervention* has seen a significant shift towards psycho-educational orientation, unlike the classical psychotherapeutic approach (Biddle, 1995). This new, holistic approach involves a step-by-step strategy, which is based on the learning outlook and an optimal way of coping. It is thus possible to maximize the results, although the predictions are never fully confirmed to all athletes, often unable to control all aspects involved in performance (Andersen, 200; Singer et al., 1993).

2. Motivation of the thesis subject's choice

Due to the fact that biathlon is a complex discipline in which the athlete is requested at a high level both physically and mentally, it is necessary to apply the principle - consecrated in all sports, but there is no need to balance the physical-motor and psycho- -affective with the same skill as in this sport - that in addition to physical training, a sustained approach is also needed in their preparation, both psychologically (mentally-cognitive and affective).

Personal experience as a psychologist (specialized in winter sports) has made me ask myself some questions about the lack of resistance of some athletes in terms of long-term career in sports. Among these, we initiated this approach from a central question: *Why do some*

succeed, and others do not, be performers but also why they can support (or not) this performance?

It is known that stress and competition anxiety are major problems facing a great deal of performance athletes. This is the stress and performance anxiety experienced by athletes before a competition. This may affect the outcome quite a bit during the sporting competition and may even lead to a real failure, despite the efforts and the profound exercise before the competition (Biddle, 1995; Weinberg and Genuchi, 1980). For this reason, it is important first to understand the factors that predispose to these psychological mechanisms that dramatically limit performance, how we can reduce them and keep them under control.

The literature on this area emphasizes that, in addition to the physical and technical training of athletes and the theoretical and practical knowledge of trainers on the learning and training strategy for sporting success itself, it is absolutely essential for athletes to know and manage emotions, feelings and rational thinking to improve their sporting performance. The more psychological training of athletes in sports training is more adapted and oriented to the model of training for high performance athletes, the more likely the results of the competitions will be maximum, but especially in the longer term, they will be higher. The more psychological intervention and assistance is more specialized and objectified, in competitions, the athletes' performance capacity can be maximized.

The research was born out of a practical necessity to find answers to some of the causes that lead to the failure of performance athletes in competitions, especially in international competitions, where individual stakes and expectations (athletes, coaches, supporters) and sports clubs and sponsors, with sometimes even national implications, are so high.

On the basis of these arguments, it can be concluded that the motivation for choosing this research theme was: the need to find new effective methods and means, the elaboration of an intervention strategy to reduce competitive stress and anxiety, the improvement of psychomotor skills, the optimal balance between psychological parameters and normalization of self-esteem in order to achieve and sustain the self-efficacy that is positively reflected in sport performance.

We started from the theoretical premise but also based on the personal experience of several decades that addressing psychological training in general and using mental training techniques can differentiate between athletes and can substantially improve sports performance (current performance, but especially on the long-term).

3. The goal of the research

In a broader sense, *we aimed at achieving performance in an integrated welfare framework* for athletes (general well-being, psychological comfort both in and out of competitions), in order to achieve a harmonious, coherent connection between the practice of this particular sport complex and long-term psychosocial endurance of practicing skaters of biathlon.

In particular, we aimed at *identifying a concerted strategy to increase sport performance by reducing stress and anxiety by training through psychological training techniques*. Adjacently, through the strategy designed by the *coherence technique* and improved ways by the undersigned (which we have *called the combined psychophysiological adjustment technique*) to optimize mental training, I have proposed to normalize self-esteem, improve motivational parameters (following the dimensions of motivational persistence) and thus increase the resilience to stress and anxiety and the psycho-motor skills of the athletes I work with.

Therefore, we considered that well-designed research can help identify and capitalize the emotional and social skills of athletes in training and competitions, evaluate the effectiveness of applied research techniques and methods and improve them, tools and methods detailed in the section dedicated to the methodology (Chapter 5).

4. The research phases and chapters syntheses

The first phase was *the documentation* of classical and more recent approaches in the scientific knowledge of the topic approached. The most relevant theoretical and conceptual references identified in different libraries and on national and international academic profiles, as well as in international databases (Ebsco, ProQuest, Science Direct, etc.) were selected and exposed. At the same time, the results of research published in articles and studies on the main topics covered in this doctoral thesis were presented: self-esteem and self-esteem, evaluation methods and adjoining conceptions, motivation, sport performance and optimization (with reference to success and maintenance techniques, coping and resilience), anxiety, stress, mental training and psychological techniques practiced by sports coaches and psychologists - all with

reference to professional sports, with emphasis on athletes practicing biathlon. All these syntheses in the literature are outlined in the first four chapters.

The *central conceptual-theoretical themes* under consideration (being allocated a chapter), to which the research approach was related were: the sport self and performance in the psychology of sport, the emotions in sports activity (anxiety, stress, coping modalities), mental training.

From *the first chapter*, which is assigned to the *performance sport psychology* (self and performance), we have identified as relevant for our own objectives the following theoretical constructs:

- *Self efficacy* (the perception of ability to achieve goals, meaning self-evaluation of abilities and skills to achieve our goals through the fulfillment of concrete tasks, the concept covering also the effectiveness of coping strategies for problems and crises, in order to achieve goals - Chelcea, 2006; , 2001);

- *Self-esteem* (the conjugated dimensions of self-confidence and self-esteem - Humpreys, 2006; Tom, 2005) and tests devoted to assessing the level of self-confidence;

- *Internal locus an external locus of control* (positioning of control in the sphere of personal responsibility or outside - Phares, 1955, quoted by Chelcea, 2003);

- *Motivation*, from which we have taken into account the theoretical constructs and the theoretical frameworks of: the motivational persistence, the functional analysis, the theory of self-efficacy, the theory of social cognition with the integrated version of Lazarus' cognitive-motivational-relational model (1999, 2000), which means different ways of problem solving: goal-oriented-task-oriented on problem solving, emotion, avoidance / detachment or (re) evaluation of the problem (action frameworks that will prove useful in coping strategies and resilience ability of athletes) (Ryan and Deci, 2000). The idea behind this selection is that sports psychologists, technicians, coaches need to be aware of these coping strategies and resilience skills and give athletes the opportunity to access and combine them, in addition to proper use by them the psychological traits that facilitate the players' sports excellence (Weinberg and Gould, 2011; Singer et al., 1993).

- *Sports performance* is a direction where many human and financial resources have been invested, the model that best describes it is the psychological high performance pyramid (Gould and Damarjian, 1998, Danish quoted, 2001) where the necessary components for success

are hierarchy: profound personality traits, psychological capabilities and strategies, coping strategies, noting that performance is a process, not a moment. Performance is influenced by the athlete's external environment (physical, socio-psychological, managerial-organizational), and the attitude and attitude factors of the athlete. The combination of factors related to training itself (coach training in collaborative strategies with athletes), sports psychologist (whose skills aim at counseling in order to ensure optimal coping) and the psychological qualities and profile of the athlete is a necessity for obtaining and support for performance (multifactorial vision - Richard and Halliwell, 2014).

The second chapter addresses *emotions in performance sports*, where after inventing the definitions, classifications and theories assigned to this topic, I focused on two useful constructs for my own research: *anxiety and stress*. Their causes (psychological, social) and the associated dimensions that work together in the direction and intensity of this state are perfectly applicable to performance sports, where fear of failure, distance between high goals and effective performance, limiting mechanisms to achieve success are the trigger factors of anxiety competitive and dysfunctional stress.

Anxiety has a multidimensional nature, which is also found in its researches, where there are many associative intersections with stress, coping, adaptive mechanisms and the cultural, group and organizational environment. A remarkable contribution of Folkman (1997, cited by Folkman, 2008) was brought into the modeling of *stress and coping*, refining the previous theory through *the revised stress model* that has been applied successfully in recent studies in the field: the coexistence of positive and negative emotions in periods of prolonged stress; the function of positive emotions to restore balance in relation to physiological, psychological and social coping resources; the way in which multi-level coping processes take place that lead to positive emotions including benefits such as identification and reminders, the process of adapting to purpose, reordering priorities, attaching positive meanings to lived events (pp. 6-11).

In a synthesis of this chapter, we can say that the practice has proven that *stress management* is a complex process where very diverse individual, situational, social factors are encountered and exerts different pressure on athletes (Anshel et al., 2000; Rolo, 2004; Kristiansen and Roberts, 2010; Scanlan and Passer, 1979; Van Yperen, 2009).

In conclusion, the psychology of sport aims at achieving applicative objectives in these directions (ways of coping, resilience, adaptation), pleasing the personality of the athlete and consistently taking into account the fact that his interactions with the social group and with the society are interactive, and the goal of sports psychologists is to help them to enjoy the full benefits of social benefits.

The third chapter is devoted to *biathlon*, proposing to describe this sport in a clear manner, so as to show: the evolution of this sport; development of the regulation; the methodical particularities of the training technique improvement (concentration ability, nervous activation, training in competitive conditions, the methodology for realizing the profile, biathlete psychological model). Since the subjects in the two groups of research are athletes who are legitimate in this sport, we have considered that illustrating the specific requirements of biathlon is of great relevance in engaging research interpretations. The last subchapter is allocated to the biathlon situation in Romania, the evolution and current status of the clubs with this profile from us.

The fourth chapter introduces some central dimensions of *psychological training*: relaxation and balancing, mental self-programming, total training, psychological training, self-regulation of mental states, nervous activation, optimization of coping and resilience performance, etc. Thus the bases of knowledge of the appropriate psychological intervention perimeter within the applied sport are put in place. Here are also sections that describe the concepts of Mindfulness and Mindfulness and their range of applications, as well as studies on stress, anxiety and coping in performance sports. The more variability of personality profiles and contexts, modes of activation, and pressure on athletes is greater, coping strategies are more diverse and often combine, so it is so important that individuals already have the experience using all these ways to reduce anxiety and competitive stress. In this way, they will be able to identify and access the ways that best fit them to improve their performance and mental capacity to defend themselves from bottlenecks in competitive sports, to develop resilience, a concept of which is increasingly invoked in psychology, especially in the positive psychology.

Transversally, the entire theoretical synthesis and the studies that looked at the dimensions and springs of performance emphasize the idea that *psychological expertise and consultancy*, as well as the *active use of transdisciplinarity and interdisciplinarity*, are real needs in the management and conduct of contemporary sport (Andersen, 2001; Singer et al., 1993). The

more psychological intervention and assistance is more specialized and objectified, especially in competitions, the better the athlete's performance capacity.

The second phase of the research consisted of *identifying and exposing methods, techniques and instruments* consecrated as representative and validated in recent researches of topics close to the one proposed in this paper. Thus, several instruments have been selected to measure psychological and physiological indicators considered relevant to the purpose of the investigation. These tools have been confirmed to be psychometric and experimentally appropriate in international systematic researches, being chosen according to several criteria: the personal opportunity related to access to subjects and the repetition of the mental training techniques of the experimental lot and the tests applied to both lots at intervals time agreed to be appropriate to obtain verification of the changes that occurred between the tests; their degree of suitability to the nature of the subject studied; the risk-free way of collecting data; the reasonable cost of applying the techniques; facilities related to place, period, context, mode of assessment and testing; value and relevance of collected data. These tests / instruments and apparatuses (as a methodological device for checking the transformations resulting from the mental training techniques) were: EMWAVE2; ASSI; SPM; DASS; EMAS; PSI TEST; STABILOMETER - subchapter 5.2.

The tests (questionnaires, scales) and the selected measuring instruments were taken and applied according to the academic and scientific rules required by the ethical and scientific procedures, the degree of suitability of the translation of some of them in Romanian being verified by the pilot study (pre-testing phase), following which some items have been improved to make it clearer, and other themes have been further elaborated in order to gather as accurate and valid information as possible in the actual research.

The third phase of the research consisted in *the improvement of two mental training techniques* that I regularly work with at sports clubs where I work. These techniques are: the *coherence technique* proposed by the HeartMath Institute with the EmWave device and the *combined psychophysiological adjustment (regulation) technique*, which is its own contribution to the psychological training methodology. These ways of reducing stress and anxiety are the contribution made to knowledge through this research, an applicative contribution, the

techniques used in the research being the independent variable, according to which we assumed that the results of the psychological and physiological tests and measurements selected in step the second research will know differences. I consider that the testing of these techniques brings a valuable added value to the knowledge in the field of sports training, more precisely in the very important branch of sports psychology. These psychological training methods have been built as their own techniques, following the improvement of well-established psychological training for performance athletes, based on experience, systematic observations and pre-post and after-test testing of young athletes. All the tools and procedures are presented in the description of the mental training methods related to those from which they are derived (subchapter 5.2.4 and subchapter 5.4.).

The fourth phase of the research was the *building of the groups of subjects* in order to establish the psychometric coordinates and the validity of the applied techniques and instruments, both of those previously verified by international and own research. The two groups of subjects in *the pilot study* consisted of: 10 athletes grouped in two lots (control and experimental) who volunteered to be pretested, these being the parameters needed to be integrated into the sample targeted by the overall survey (goal and objectives), ie junior athletes and legitimate cadets in biathlon, with a minimum of 2 years of practicing the sport in the clubs concerned.

The fifth phase of the research was the development of the actual research: *the application of established instruments* as well as *the reducing stress techniques* which was personally built, the latter being subjected only to the subjects of the experimental group between the initial and the final testing. The two groups, consisting of 15 subjects, were junior athletes from two equal sporting sports clubs (C.S.S. Vatra Dornei and C.S.S. Baia Sprie), measuring the psychometric indicators targeted at the initial and final phases to be able to record the changes. After the experimental group was applied, in the interval between the tests, the mental training methods, the final tests followed the psychometric differences registered between the groups to: motivational persistence, self-esteem, stress, anxiety, attention indicators, coordination and speed reaction. Subsequently data was centralized and processed statistically.

The sixth phase of the research included *the interpretation of the results* by comparing the data obtained in the two lots, *analyzing and discussing* them in terms of theories *and verifying the validation of the psychological training techniques* proposed in the investigation.

Finally, I drew up the *general conclusions* of the research, *my own contribution* to knowledge, and some *more general proposals*, with reference to possible improvements in sports policies, focusing on the contribution of sports psychology to optimizing performance and enhancing adherence to sport young people who are legalized at sports clubs in Romania.

5. The description of the empirical research

Description of the population of athletes from which the sample was selected

In Maramureş County, biathlon sports clubs have a total of 163 certified athletes in all age categories, of which 134 are enrolled in the national competition system in the year 2016. In this county, the Baia Sprie School Sports Club is ranked 7th in the total ranking of sports units to the national championship score.

In Suceava County, in 2016 there were 199 athletes certified for biathlon on all age categories, out of which 122 were enrolled in the national competition system. The Vatra Dornei School Sports Club in this county was ranked 19th in 2016 in the total ranking of the sports units for the national championship score, but in the previous years it had better positions. Under the MENCS, the Vatra Dornei School Sports Club is ranked No 210, and the Baia Sprie School Sports Club is ranked No 198 in the rankings for youth, junior and cadets (Sports Performance Development Division, 2016 edition).

Being a sport that does not require investment from home families, provides a sporting rent and free maintenance and schooling conditions in sporting clubs for legitimate children and provides a relatively safe future in terms of employment, it is not surprising that students who enroll in this sport often come from modest or even precarious social environments. Most Biathlon athletes (juniors) from Baia Sprie (Maramures County) come from families of formerly laid-off miners, from surrounding villages or from families in the city with some running problems. In Vatra Dornei, all enrolled children come from rural areas, mostly from families

with many children and modest incomes. The participation of these small athletes in a sports program financially supported by clubs (from the budget) is a solution for their families, and for juniors a chance to have an assured future.

Therefore, more than in other sports, these children come with a rather problematic emotional and relational baggage. Many of their qualities can not be worthwhile precisely because of the psycho-emotional problems that persist, self-confidence, motivation and aspiration for success. And here comes the role of the school / sports counselor / psychologist: to maximize the chance to keep these children in sport and give them the chance to offer the best in competitions and later in their career. To this end, it is really necessary to reduce stress, to encourage a harmonious personal development of those small athletes.

The two junior teams (control and experimental) were tested at one year (initial testing and final testing).

In this time interval, the *experimental group* (15 athletes certified at the ski-biathlon section, Baia Sprie School Sport Club – Lot II) was regularly (6 times in the 12 months) of the fast technique of obtaining the coherence and the combined technique psychophysiological adjustment simultaneously to achieve overall psychophysiological coherence and relaxation, resulting in an optimal positive balance between the cardiac, psychomotor and emotional elements where the nervous, cardiovascular, hormonal and immune systems converge to well-being (see also McCraty and Tomasino, 2006).

In this way, the *independentvariable 'mental training'* (the technique of coherence and the combined technique of psychophysiological adjustment/regulation) was introduced to the target group, a change element supposed to have acted between tests, among dependent variables: *stress, anxiety, psychomotor skills, motivational persistence, and self-esteem.*

The *control group* (15 athletes certified at the ski-biathlon section of the Vatra Dornei School Sport Club - Lot I) did not participate in this constant application program of EmWave2, the athletes in the control group being mentally trained and tested only in the two recording moments (initial phase and final phase) with the same methods used in the experimental lot.

Measuring, identifying anxiety levels, stress, coordination, attention, memory, self-image / self-confidence, motivational persistence with the help of specific psychological tools represent an important step in the process of optimizing individual performances, in sections 5.1.and 5.2, but also in other subchapters of the thesis.

Purpose, objectives and stages of research

As a general goal in conducting research, we have designed *an intervention strategy to reduce competitive stress and anxiety, improve motor skills and normalize or maintain normal self-esteem and optimal motivation.*

The *specific objective of the research* was *to appreciate the extent to which mental training through the technique of coherence and the combined technique of psychophysiological regulation has statistically significant effects on the biathlonists* (on the dimensions tested: stress, anxiety, psychomotor skills, self-esteem, motivational persistence), in order to expand and improve it in future to the groups of athletes I work with. From here derived:

A) *Main objective*: Reducing stress and anxiety in biathlon, as well as improving psycho-motor performance.

B) *Secondary objective*: Establishing and optimizing the content and structure of the psychological training program during an annual training cycle.

What constituted *the ultimate goal of research*, in terms of openness to future applications, was *to achieve the long-term effectiveness and performance of the athletes under study, through mental training specific to psychophysiological coherence and combined technique.*

Methodology and research stages

Tests (scaled, questionnaire) applied were:

i) EMAS (Multidimensional Anxiety Evaluation Scale of Endler) is a set of three easy-to-use scales that measure different types of anxiety: Emas S, which measures anxiety as a condition; Emas T that measures anxiety as a trait; Emas P, which measures anxiety as a perception. Being multidimensional, these scales allow interpretation of test results and the association of scores obtained with other areas of personality functioning. This test indicates the amplitude of anxious individuals' reactions and the individual pattern of anxious reactions in

different situations. Increased anxiety indicators are assessed by reference to four general situational contexts: social assessment situations, physically dangerous situations, ambiguous situations (with anxious potential), and routine daily situations.

ii) DASS (Depression and Anxiety Stress Scale) is a psychological test that aims to evaluate anxiety and depression constructs, identifying the essential features of each syndrome, being carefully constructed to avoid overlapping variables, thus facilitating the diagnosis, the correct result (Henry and Crawford, 2005). The questionnaire contains items grouped on 3 scales, corresponding to depression, anxiety and stress. The depression scale targets dysphoria, hopelessness, loss of personal value and self-esteem, loss of interest, loss of satisfaction, and loss of motivation. The anxiety scale tracks vegetative hypertonia, muscle and vegetative manifestations, anxious situations, and the way fear is perceived. The stress scale tracks the variables that indicate the person's irritability, reactivity and motor activity when stressed. The final score is to aggregate the results for each scale (each item corresponds to scaled specific scores from 1 to 3) (Lovibond and Lovibond, 1995). The questionnaire includes a set of three self-assessment scales on negative emotions related to depression, anxiety, and stress and emphasis on states rather than traits (Crawford and Henry, 2003).

iii) ASSI (Low Self-Esteem - Self-Deprivation, Medium Self-Esteem- Normal, High Self-Esteem - Infatuation) is a standardized test - through a standardized questionnaire - that evaluates self-esteem as an individual trait. It follows the three degrees of self-esteem, as they were thought by Rosenberg (1979): "normal" self-esteem (average score on the total score scale), self-depreciation (low value) and infatuation.

iv) SPM (Motivational Persistence Scale) (Wise, 1996, quoted by Constantin et al., 2011) evaluates motivational persistence, a concept that describes an employee's predisposition to persist motivationally in the effort directed to achieving an assumed goal by identifying the personal resources required (which may also mean refining motivation) to overcome obstacles and develop resilience to routine, stress, fatigue, and other factors that disrupt the goal. The measuring instrument consists of a questionnaire with items grouped into the identification of three factors: Long Term Purpose Pursuing (LTPP); Current Purpose Pursuing (CPP) and Recurrence of Unattained Purposes (RUP) recurrence. By aggregating the scores obtained in the three factors, individual motivational persistence (the ability to persevere, the motivational

capacity to achieve ambitious goals, and the attitude of persistence, to invest time and effort, not to abandon) is assessed (ibidem).

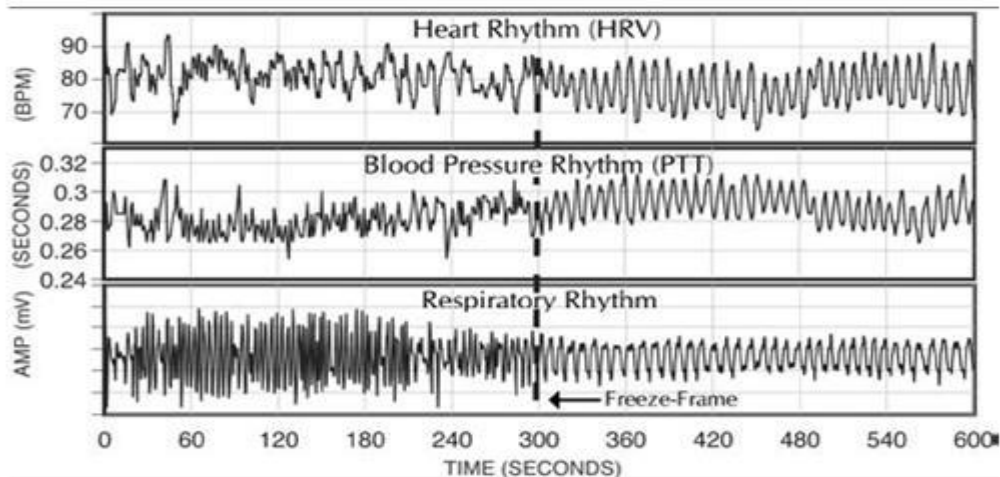
Measurement technology (tools)

Apparatus, equipment with which the proper psycho-physiological indicators (recorded by techniques and direct specifics through computer systems and devices) were measured:

a) An ECG like EmWave2 helps to optimize the rhythm to create physiological coherence throughout the body, indicating three levels of coherence: low (red), medium (blue), high (green). In essence, this technique can rapidly bring the heart rate to the state of coherence (McCraty, Atkinson, Tomasino and Bradley, 2009; McCraty and Zayas, 2014). EmWave2 uses two combined software - EmWave Desktop and EmWave Personal Stress Reliever - to measure coherence, and achieving coherence to reduce overall stress occurs through the specific relaxation technique of the product.

The HeartMath Research Center has published a series of results of studies on the heart and physiology of emotions, and has conducted several researches that have identified the bizarre relationship between emotions and heart, with emphasis on the role of stress in this relationship. The results have contributed to a new insight into the scientific community about how heart activity is related to emotions and our health, vitality and well-being.

In 2010, a new version of the EmWave (Desktop for PC and Mac) software was developed, which monitors heart rate, breathing rate and pace, combining these parameters with a patented model illustrating the state (imbalance or coherence):



(the image is taken from the HeartMath Institute website: www.heartmath.org/research)

EmWave calculates and displays the heart rate model by detecting the finger or ear pulse with an electronic sensor. It describes the acceleration and slowing of heart rate and analyzes the pattern of heart rate. In addition to seeing real-time heart rate, the level of coherence, based on the combined pattern of heart rate, tension and breath, appears on the screen. A more relaxed heart rate pattern indicates a more synchronized autonomic nervous system and a more balanced emotional and mental state. A narrower, more irregular pattern indicates a less synchronized nervous system and a more stressful emotional and mental state. Using a patented algorithm, EmWave2 analyzes the degree of constancy or inconsistency of heart rate and assigns a score. As the score improves, it enters the high coherence area.

Using Coherence Coach® and learning the technique of rapid coherence, subjects will be able to better manage their emotional responses and increase their level of coherence. EmWave postulates indicators that describe how the heart and breath respond to various stressors and anxiety or fatigue, providing real-time feedback at the time of recording. It captures and quantifies the "peak" area of the test person and teaches it, by applying the relaxation technique, to recreate that state of maximum performance when faced with a state of imbalance, stress.

b) PSI (PSITEST Cabinet), a psychoinformatic system designed to optimize the activity of psychological examination offices. This test is the transfer of computer-aided classical security batteries generously used in industry, transport, etc. Globally, the test aims at obtaining the indicators that configure the "safe behavior" postulated by Bonnardel, Lahy and Bremond

(1954, quoted by Epuran et al., 2008) in the following directions: information, execution, and self-regulation. The method evaluates interactively (by examining the monitor) essential psychological elements in assessing psycho-cognitive and motor skills: perception (speed, accuracy), attention (concentration and distributivity), operative efficiency of thinking. These parameters are useful in highlighting the aspects: motor learning capacity, proper coordination, suitability and synchronization of movements, reactivity and speed of response, reorganization of responses, retroactive inhibition. The reaction time is evaluated at all these parameters.

c) Stabilometer (Code: EM-05.47 M), which determines (difficult to record with other technical means): kinetic, neuronal and psychological adjustment. The central electronic unit receives signals from the sensors of a plate provided with a movable plate, supported at a single central point, on which the subject ascends with the task of keeping it in a horizontal position (Chelcea, 1994). This apparatus tests: the perception of the balance, the level of control of the orthostatic position, the safety of the body movements, the ability to maintain the balance, the ability of the correction of the deviations, as well as an indicator of the neurological affections (Ticu 2004, Chelcea, 1994). Test recording is displayed on a monitor and printed.

Mental training techniques used in their own study

Coherence technique (HeartMath)

Quick Coherence Technique, developed by the Institute of Heart Math, states that using the heart's power to balance thoughts and emotions, energy, mental clarity and well-being can accumulate very quickly, no matter where the application takes place.

The technique is indicated to be particularly useful when negative feelings occur that exacerbate the person of energy such as anxiety, frustration, irritation or anger. The new feeling to be brought forward is the one that induces the state of inner and floating harmony in accordance with the heart rate, which will help the brain function in normal parameters and synapse (ibidem).

The key concept of coherence technique is intelligence of the heart, in fact a metaphor describing the state of relaxation, recorded by biofeedback technology - EmWave technology, ie rhythm, heart rate and breathing. Mental technique uses the power of the heart to order and

balance thoughts and emotions, helping the athlete achieve a neutral, balanced state to clear his mind. Over time, it has proven its effectiveness using heart energy (pumping constant blood to the brain through pulse and balanced heart rate associated with regular breathing) to eliminate stress, emotionally balancing, and get a feeling of well-being, extremely fast McCraty et al., 2009).

When the individual is in a state of coherence with the rhythm of the heart, the best performance is achieved - what performance athletes name as "being in shape." The predominant feeling is confidence, positivity, concentration, calm and full energy (McCraty and Zayas, 2014). The mental training model proposed by Heart Math institutes focuses on 3 relationships: emotions and heart, the effects of emotions on self-esteem and the benefits of self-appreciation. This technique consists of three stages: *focus on the heart, breathing of the heart, and feeling with heart.*

Combined psycho-physiological adjustment (regulatory) technique adapted to psycho-relational and multimodal approaches and mental training (own contribution) consists of four steps that combine multimodal therapy and mindfulness / mindsight in stress and anxiety management proposed by Bergland (2015), Inner (2017), Lazarus (1981), Morton (2017) and Siegel (2017).

The stages of this technique are: *directing adrenaline energy in a positive sense (cognitive restructuring) for performance; exercise of diaphragmatic breathing accompanied by micromuscular relaxation in the head area; general muscular relaxation mentally guided (imagery); repeated refocus, mental concentration, no strain.*

An option for a quick meditation technique is to spend one minute refocusing breathing, a minute focused on the body's breathing sensation and a final minute focused on what the individual feels at the current level (respiration, body sensations, sound etc.). Another way of rapid meditation, useful in reducing precompetitive stress, is three minutes of mindfulness-based cognitive therapy. This technique precedes, in its own research, the rapid technique of obtaining coherence.

In the **pilot study** (pre-testing the ways to reduce stress and anxiety in biathlon athletes), we applied two techniques to reduce stress and anxiety and optimize

psychophysiological parameters, one belonging to the Heart Math Institute (translated into Romanian) - the quick technique of achieving coherence - and another made by me - the mixed psycho-physiological adjustment technique (combining psycho-relational and multimodal approaches to mental training) to an experimental group, junior biathlon group with whom I am currently working as a psychologist. The results were compared with those obtained by the control group.

In **the actual research**, these two techniques were applied (together) before the major training exercises, only to the experimental group, during the precompetitive national biathlon race in February 2015 and 2016, which constituted the independent variable.

We have tracked their effect on the previously described independent variables, that is, on various parameters regarding:

- Coherence rate - EmWave2 device
- Self-esteem - ASSI self-esteem scale
- Motivational persistence - SPM Motivational Persistence Scale
- Stress - DASS Stress Scale
- Anxiety - Endler EMAS Anxiety Scale
- Concentration of attention and reaction speed - PSI Test
- Coordination of movements - Stabilometer

List of abbreviations - methodological indicators

Score - scor at EmWave2 testing
FC med – average heart rate
A – self depreciation
I – self infatuation
SN – regular self-esteem
LTPP - long term purposes pursuing
CPP - curent purposes pursuing
RUP - recurrence of unattained purposes
PM – score of motivational persistence
DASS – stress scale DASS
EMAS – anxiety scale EMAS
VP – speed of perception and concentration
CMC – motor coordination
AR – concentrate attention
Stab - stabilometer

Tests for the dependent variables (EmWave, ASSI, SPM, DASS, EMAS, PSI and Stabilometer) have not been changed, and these are assumed to be valid tools, being licensed as a high degree of validity and fidelity in applied psychology. Pilot testing was conducted two weeks before the actual investigation was started (initial testing - Chapter 6 - and final testing - Chapter 7).

The three **phases of the pilot study** and the technical data collection components by successive stages, are described in Table 1:

Table 1. Structure of the pilot study

Phases of the pilot study and applied tools / techniques		
Phase 1 (2 hours before training)	Phase 2 (30 minutes before training)	Phase 3 (2 hours after training)
<p><u>Followed indicators:</u></p> <p>Coherence rate - EmWave2 device</p> <p>Self-esteem - ASSI self-esteem scale</p> <p>Motivational persistence - SPM Motivational Persistence Scale</p> <p>Stress - DASS stress scale</p> <p>Anxiety - The Endler EMAS Anxiety Scale</p> <p>Concentration of attention and reaction speed - PSI Test Cabinet</p> <p>Coordination of movements - Stabilometer</p>	<p><u>Applying mental training techniques:</u></p> <p><i>Rapid technique for achieving coherence</i></p> <p><i>Combined technique for neurophysiological adjustment (regulation)</i></p>	<p><u>Followed indicators:</u></p> <p>Coherence rate - EmWave2 device</p> <p>Self-esteem - ASSI self-esteem scale</p> <p>Motivational persistence - SPM Motivational Persistence Scale</p> <p>Stress - DASS stress scale</p> <p>Anxiety - The Endler EMAS Anxiety Scale</p> <p>Concentration of attention and reaction speed - PSI Test Cabinet</p> <p>Coordination of movements - Stabilometer</p>

The above tools (checking the psychometric parameters concerned) were validated in the pilot study.

Some of the instruments for measuring psychological and physical parameters have been applied individually and required materials such as paperless pencil, without time limitation: self-esteem scale, motivational persistence scale, anxiety scale and stress scale, PSI test.

Other data collection tools were made using standardized measuring instruments (EmWave, Stabilometer).

Mental techniques - to achieve coherence and psychophysiological regulation - have been applied individually, guided by the undersigned, being of one to one type face to face.

The stages of the research itself

Table 2 describes the *methodological framework and time strategy of comparative research*:

Table 2. Methodological elements (initial study and final study) and time frame of the research

Initial and final testing:	Frame time (between tests)				
<i>February 2015 (first study)</i>	<i>Between March 2015 and January 2016</i>				
<i>February 2016 (second study)</i>					
Group I, control (15 subjects, CSS Vatra Dornei)	<table border="1"> <tr> <td data-bbox="862 1014 1203 1081">Group II (CSS Baia Sprie) Mental training</td> </tr> <tr> <td data-bbox="862 1115 1357 1251"><i>Coherence technique and Combined technique for neurophysiological adjustment (regulation), applied monthly to subjects in the experimental group</i></td> </tr> <tr> <td data-bbox="862 1398 1357 1465"><i>Colectarea datelor: EmWave2 technique for coherence</i></td> </tr> <tr> <td data-bbox="862 1528 1357 1633"><i>Data analysis: observation, psysiological measurements (feedback) by applying EmWave 2 technique</i></td> </tr> </table>	Group II (CSS Baia Sprie) Mental training	<i>Coherence technique and Combined technique for neurophysiological adjustment (regulation), applied monthly to subjects in the experimental group</i>	<i>Colectarea datelor: EmWave2 technique for coherence</i>	<i>Data analysis: observation, psysiological measurements (feedback) by applying EmWave 2 technique</i>
Group II (CSS Baia Sprie) Mental training					
<i>Coherence technique and Combined technique for neurophysiological adjustment (regulation), applied monthly to subjects in the experimental group</i>					
<i>Colectarea datelor: EmWave2 technique for coherence</i>					
<i>Data analysis: observation, psysiological measurements (feedback) by applying EmWave 2 technique</i>					
Group II, experimental (15 subjects, CSS Baia Sprie)					
Both groups were tested EmWave2, ASSI, SPM, DASS, EMAS, PSI, Stabilometer					
<i>Data collection:</i> Psychological tests (questionnaires) administered to both groups and psychological and physical measurement instruments for identifying objective parameters					
<i>Data analysis: statistical analysis</i>					

It should be noted that the two lots are *comparable* by: the mean and middle age of the subjects, the value of sports clubs, the distribution by gender. Each batch has 2-3 "peaks" (junior champions at different competitions) and the category of athletes aspiring to performance and

dedication, but have not yet achieved any outstanding results. In this way, the parameters required for the analysis of the differences on lots meet the requirement of comparability in experimental research.

6. The main results and interpretations

In order to have an overview of the results, I synthesize in the table below *the significant differences in the data obtained from the tests applied to the batches in the initial phase and the final phase*. We have only taken into account the differences that have made statistically relevant changes after the comparative analysis of the data.

Table 3. Differences in test results, by groups and and research phases

Test results					
	<i>Control Group</i>		<i>Experimental Group</i>		<i>Scaling</i>
Measuring instruments and apparatus	Initial test scores (February 2015)	Final test scores (February 2016)	Initial test scores (February 2015)	Final test scores (February 2016), after application of the mental training techniques on a regular basis for 11 months (February 2016)	
EmWave2 Global coherence score	73,60	138,87	78,87	162,60	
ASSI Normal self esteem	6,67	7,40	7,47	7,93	Scaling from 1 to 10 1 - minimum; 10 - maximum; low values indicate low self-esteem, high values indicate high self-esteem
SPM PM LTTP CPP RUP	3,27 3,13 4,07 3,00	4,0 3,80 4,60 4,40	4,60 4,27 4,33 4,40	5,67 6,60 6,27 7,13	Scaling from 1 to 10 1 - minimum; 10 - maximum; high values

					indicate good and very good motivational persistence
DASS	1,18	1,24	1,17	<i>0,77</i>	Scaling from 1 to 5 1 - minimum stress level; 5 - maximum stress level
EMAS	42,93	42,80	40,33	<i>35,73</i>	Scaling from 1 to 100 1 - minimum level of anxiety; 100 maximum anxiety level
PSI TEST CMC	64,20	68,80	76,47	<i>81,67</i>	Scaling from 1 to 200 by aggregating the scores obtained in the three test pointers
STAB.	48,80	47,93	55,60	59,53	Scaling from 1 to 100 in the same cumulative way of the scores obtained at the parameters included in the measuring instrument

Note: Numbers marked with bold and italic represent statistically significant differences – appears at experimental group only

To better outline *the significant differences for the experimental group* (described numerically in the previous table) recorded at some parameters, I concentrated them into one figure.

So, we've included all the dimensions where these changes occurred by adjusting the values of the 1 to 10 scaled indicators by multiplying them by 10 or dividing the proportions to values above 100 points so that the differences are comparable to scores from 1 to 100 from

other tests, and visualization to allow clearer understanding of the overall results (observed improvements):

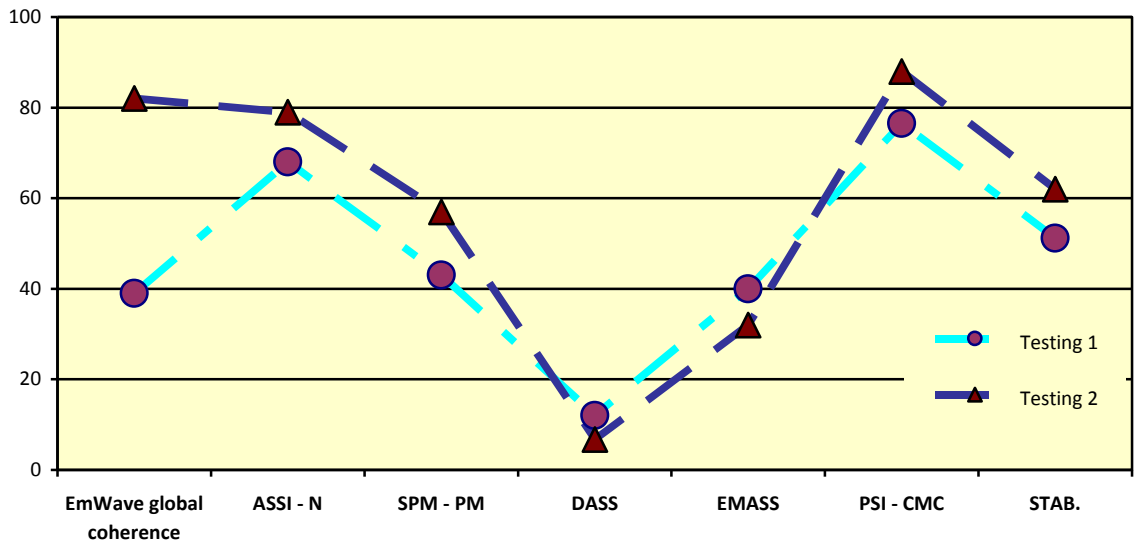


Figure 1. Relevant results (significant differences) obtained from tests (T1, T2) applied to the experimental group

From the many *theories* that addressed the phenomenon, our study found appropriate in the interpretation of the objectives, the *Multidimensional Theory of Anxiety* that starts from the premise that the experimentation of anxiety occurs both at the psycho-cognitive level and at the somatic-physiological level through a wide series of manifestations with major implications in all areas of human activity (Goldie, 2000; Jones and Cale, 1989; Klein, 1987; Martens et al., 1990).

Another theoretical anchor was the theoretical range of motivation, starting from classical assumptions (Allport, 1936; Skinner, 1969, quoted by Iluț, 2009). These approaches have oriented the theoretical interpretations in two directions of analysis: the *establishment of the relationships between the cognitive and motivational aspects or various applications in which the determinants of the motivation or its consequences* on the individual, the groups, etc. are explored (see Higgins and Sorrentino, 1990; Iluț, 2009).

The first vision operates with several key concepts: *accessibility* (as cognitive principle) or *regulatory focus* (focus on normalisation) describing the various mechanisms involved in dispositions and behaviors (Higgins, 2004).

The second range of theoretical interpretations is part of the *Self-Determination Theory*, which emphasizes the effect of intrinsic factors (autonomy, competence and relationship) on motivation to achieve goals, task and adaptation to the school, sport and professional context (Ryan and Deci, 2000).

The *Theory of Motivation through Competence* (Weiss and Chaumeton, 1992, quoted by Weinberg and Gould, 2003, p. 67) argues that the need to feel valuable and competent is the primary determinant of motivation. These feelings do not directly influence motivation, rather they influence emotional or emotional states (pleasure, happiness, satisfaction, anxiety, pride and shame), which in turn influences motivation. Between the level of self-esteem, positive emotional states related to a certain activity and motivation, the ties are tight and direct.

Unlike the interpretation of the Motivation Theory by Competence, *Cognitive Assessment Theory* insists on the role of external factors (material gratifications, status, terms, evaluation, etc.), reducing the sense of autonomy and placing the causal chain in motivation and behavior towards external causes, to the detriment of intrinsic motivation (Higgins, 2004). Thus, sentiments of competence will not maintain or improve intrinsic motivation, unless they are autonomous, self-assumed.

Functional Analysis is a specific theoretical perspective that is particularly lucrative in interpreting motivational persistence that postulates that motivation in any sustained activity is contrived as a process based on two distinct psychological elements: goal choice and goal striving (striving to reach the goal) (Gollwitzer, 1990).

The ***comparative results obtained*** showed that the most relevant differences between batches recorded at the two test points, as follows:

- The statistical analysis of the values of the *EmWave2 test* showed the positive effects in installing the state of coherence by EmWave2 and the combined neurophysiological control technique, even if the control group was not subjected to it on a regular basis. Thus, the effects on the experimental group are highly significant, comparing it with the control test: at the second test, the experimental group had a coherence score of 162.60, while those in the control group only 138.87. And on the level of coherence, those in the experimental group obtained a mean value of the high level of significantly higher coherence score with the

control group. Here are the assumptions of the multidimensional theory of anxiety (Goldie, 2000; Jones and Cale, 1989).

- The results from the application of the *ASSI questionnaire* revealed that significant differences between batches between tests, regarding: self-deprivation (low self-esteem), have a large initial value for those in the control group, which however decreases to the second test, but this difference does not appear in the experimental group. In both groups, at the second test, the average score of normal self-esteem appears to be increased (moderately significant difference), and again more accentuated in the control group versus the experimental group. We have raised the average to the value of normal self-esteem in both groups, both on account of maturation and the specific mental training we have conducted with these athletes in the experimental group. Self-determination theory (Ryan and Deci, 2000) provides here an appropriate explanatory framework: perception of one's own person is a mental construction mediated by assuming the individual potential and optimizing it in an intrinsic manner.
- The data extracted from the *Scale of Motivational Persistence* scores at the two time points, by lot, indicated that the experimental group had a significantly higher score in the second test than the first, to the motivational persistence (PM - global score at the three scales) compared to the outcome of the control group. This suggests that, after the period of regular mental training, there is a higher coordination of the resorts that can engage aspirations and motivations in concrete future projects, which suggests a noticeably increased level of coherence. The result emphasizes the remarkable difference between batches on the good evolution of aspects of solid and effective links between areas of motivation (especially important in sports activities) and supports both the assumptions of the Multidimensional Theory of Anxiety and the Functional Analysis (Gollwitzer, 1990). On multiple indicators, a stronger motivational integration can be observed in the athletes of the experimental group, which is also consistent with the results of anxiety and stress tests, and the fact that the experimental group had better results at the overall scores of motivational persistence than the control scores confirms what Folkman (2008) stresses on competitive stress (where the winning of individual and team results is high), that studies should place stronger positive emotions among research variables to redress imbalances between research and practice

clinical, the latter being almost exclusively marked by the focus on negative emotions (p. 13).

- Significant differences occur between tests, both in the *statistical analysis of the DASS stress and the EMAS anxiety scale*, only in the experimental group. Techniques for achieving global coherence and psychophysiological relaxation are strongly emphasized by the more effective management of anxious emotions in athletes in the experimental group, an indicator which is associated with better multi-motivational integration in the experimental group compared to the control group, as revealed of the data obtained in the SPM test of lot II. This result is consistent with field studies (Borkovec, 1976; Cooley, 1987; Gollwitzer, 1990; Holdevici, 2010; Jones and Hardy, 1993; O'Connor, Carda, and Graf, 1991, etc.). This confirms the assumptions of the revised stress model (Folkman, 1997, Folkman quoted in 2008), whereby positive and negative emotions conjugate during periods of prolonged stress, reveals the function of rebalancing positive emotions in relation to physiological coping resources, psychological and social, conjugation of multi-level coping processes leading to positive emotions, reducing anxiety and stress, etc. The result is supported by other research in the field that aims at optimizing strategies for management of stress and anxiety (Gould and Rolo, 2004; Kristiansen and Roberts, 2010; Van Yperen, 2009, etc.). In this respect, coping strategies are diverse and have a tendency to combine, which is another argument on the integrated approach to multiple ways to reduce anxiety and competitive stress, from where subjects will be able to extract those more suitable for them to improve mental performance and capacity to prevent bottlenecks and inefficiencies in competitive sports.
- The statistical analysis of the *PSI test results and the Stabilometer* showed significantly higher values of the motor coordination and the stabilometer indicators in the experimental group between the two tests compared to the control group. And here, the experimental group appears to be advantaged in the superior engagement of motor skills, which confirms the effectiveness of the relaxation and mental adjustment technique applied to this group of athletes in the specific physical performance imposed by the technical rigidities of the biathlon. Thus, the explanatory frames of the functional analysis are confirmed (Gollwitzer, 1990).

From the above results corroborated with the theoretical models and the results of other studies it can be concluded that the experimentation of precompetitive and post-competitive

anxiety has a wide range of effects on athletes from biathlon on the normalization of self-esteem, the full ability to reach the goals, the dimensions of motivational persistence, psycho-motor skills and overall performance, generally on the general psycho-physiological balance.

At the end of the study, we exposed and developed a number of **research limitations**:
A) The issue of *generalizing the results for the entire population of athletes from biathlon or the whole population of athletes*. However, the fact that groups of subjects come from clubs in different regions, as well as batching theoretically, gives validity in terms of theoretical representativeness and obtaining authentic data relevant for a small-scale approach with an exploratory focus. **B)** Possible distortions of results through *interaction with the researcher by blocking (inhibition) or lack of concentration* is one that we have meditated in the design phase of the methodological design. Reducing the shortcoming of this error: the dimensions tested were also likely to interest athletes, confidentiality and explanation, and research (scientific) purposes. **C)** The *researcher's bias during data collection and interpretations*. The danger that personal impressions may influence data collection and later interpretations has been limited by the application of scientific neutrality, which has been facilitated by the rather strict methodological apparatus and quantitative statistical quantification without interfering with the application of specific tests or measurements.

7. Applicative contributions and proposals

Applicative contributions

The increasing number of issues raised by athletes and coaches refer, in addition to the inherent physical issues deriving from performance activity, to the psychological aspects of mental training. Sports psychology is a constantly changing field that has gained theoretical and applicative expertise over the past decades. Doctoral research has made significant contributions to this end, *the technique of coherence* being a mental workout area (relaxation, concentration) with notable effects in reducing anxiety and stress, as well as attention, concentration and motricity indicators. In addition, we have experimentally improved *the combined psychophysiological adjustment (regulatory) technique* as a complementary way to improve the psychological-physiological parameters of athletes in biathlon.

I summarize the *contributions of the doctoral research* as follows:

1. More detailed knowledge of *the psychological dimensions of the athletes in the sample* (two lots), both by the researcher and by the subjects themselves. Anxiety indicators (EMAS) and stress (DASS) bring valuable information for adapting sports and psychological training to the specific needs of each athlete. And at the motivational dimensions of the athletes (SPM), the processed data provides relevant indications, showing where to work and where evolution is not even optimal in the sporting trajectory. Thus, research can be a starting point in *personalizing training* so as to take account of particular cases and thus improve both the performance and the overall well-being of the athlete.
2. *Deepening data on athletes' driving and coordinating capabilities* (PSI Test and Stabilometer) is an encouraging fact to know the strengths and weaknesses of the subjects for sports training. Knowing where improvements can be made and appreciating young people's motoring benefits is extremely useful in training, engaging in competitions, and making training more flexible according to specific requirements.
3. The results of this study concentrate *relevant differences between the control and experimental groups on almost all of the observed dimensions (indicators)*, attributable to an independent variable that intervened between the two major tests: the *technique of coherence* and *the combined psychological-physiological adjustment (regulatory) technique* both of them *applied to the subjects in experimental group*. Thus, it can be suggested that practitioners in the field of sports psychology could try to introduce these techniques into the psychological training protocol, especially in the stadiums with competitive stakes or in the moments of stress (anxiety, burnout) of athletes. The approach would be all the more valuable as the data from this research suggests that the results are cumulative, long-term, once the specific relaxation style has been learned to establish the state of coherence and the combined psycho-physiological regulation technique, and the athletes managed to induce a state of balance without being guided by a psychologist. The sooner the intervention is in the competitive career, the more the performance effects will be stronger, contributing to its long-term maintenance.
4. Especially in *biathlon*, multiple physical requirements (coordination, concentration, resistance to effort, integration of more evolving rules) imply a *major need for rapid balancing in pre-competitive times*. Competitive stress and competition anxiety can generate,

if they overcome their ability to adapt and go beyond the athlete's coping mechanism, emotional imbalances, blockages, withdrawal from the goal, and even renunciation of sport. Consequently, rapid balancing, especially in this discipline, is crucial to sustaining the focus, meeting the objectives of the competition regulation and the success it aspires to.

General proposals for the sport policy area

The results of research can be a starting point in the strategy of complementing sports and psychological training (mentally). The possible policy implications for the sports training strategy, especially biathlon, are:

- To inform practitioners in the area of sports psychology about the benefits of the technique of coherence, which would ensure a better conjugation of the two dimensions during the physical and psychological training.
- By increasing the state of harmony, balance and psycho-physical well-being, the junior athletes adhere to the sport at the beginning, which would make the investment in them as junior athletes legitimate to reflect in the long run, i.e. to bring results and in the future, and their sports career will not interrupt after just a few years.
- Higher mobilization of human resources in the field of psychology and sports pedagogy to contribute through a joint effort to achieve performance and revitalization of some sporting branches that are today neglected or less popular, including biathlon.
- Better planning of information strategies, sports management and support of juniors from the enrollment phase would be welcome to strengthen their sense of belonging, safety, self-confidence, strengthen their motivation and then persist in achievement of the proposed goals. And here, sports and organizational psychology has an important role, through its specialists.
- The study creates a promising background for the psychosocial integration of the athletes and their satisfaction with the sports career from the childhood, thus creating mental habituses that have the potential of sports engagement, adherence to sports, and the benefits for both athletes and society are obvious and incontestable. In this sense, institutional and governmental resorts would be able to support not only the practice of sports, but also the psychological convergence with this activity, thus becoming a career, a positive challenge in personal development and a positive emotion.

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