Theoretical essay on physical activity and health

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CELAFISCS' contributions to Sports and Physical Activity Sciences: a tribute to 50 years of history

Contribuições do CELAFISCS para as Ciências do Esporte e da Atividade Física: uma homenagem a 50 anos de história

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ABSTRACT

Introduction: The Center of Studies of the Physical Fitness Research Laboratory from Sao Caetano do Sul (Centro de Estudos do Laboratório de Aptidão Física de São Caetano do Sul - CELAFISCS) is a research and intervention center with broad national and international recognition. In 2024, CELAFISCS completes 50 years of uninterrupted activity. **Objectives**: Based on a theoretical essay, our objective was to promote a tribute to the 50 years of CELAFISCS by recovering its main contributions to the Sports and Physical Activity Sciences. **Development**: The complex task of summarizing the most relevant contributions of CELAFISCS was carried out through documentary analysis and testimonies in three parts: historical aspects, tangible contributions, and intangible ones. Tangible contributions were analyzed considering the scientific production and human resources training done by the members of the successive boards of CELAFISCS during this period. The intangible contributions were analyzed by the impacts of the rapprochement of Brazilian science with the most influential scientists and institutions in the world, of projects to promote physical activity, such as Agita São Paulo, in addition to the social commitment and vision of the future, which are recognized characteristics of CELAFISCS. **Final Considerations**: Our findings demonstrate that in these 50 years, CELAFISCS has had an equitable distribution by gender, a predominance of physical education professionals, and a high proportion of members involved in research. CELAFISCS has generated highly significant contributions to Sports and Physical Activity Sciences in Brazil, both in academic production and human resources training, justifying the recognition of its essential importance for developing these two significant areas.

Keywords: Study group; Health promotion; Education.

RESUMO

***Introdução**: O Centro de Estudos do Laboratório de Aptidão Física de São Caetano do Sul (CELAFISCS) é um centro de pesquisa e intervenção com amplo reconhecimento nacional e internacional. Em 2024, o CELAFISCS completa 50 anos de atividade ininterrupta. **Objetivos**: Por meio de um ensaio teórico, objetivou-se prestar uma homenagem aos 50 anos do CELAFISCS, a partir do resgate de suas principais contribuições as Ciências do Esporte e da Atividade Física. **Desenvolvimento**: A complexa tarefa de sumarizar as mais relevantes contribuições do CELAFISCS foi realizada por meio de análise documental e de depoimentos, em três partes: aspectos históricos, contribuições materiais (tangíveis) e contribuições imateriais (intangíveis). As contribuições materiais foram analisadas à luz da produção científica e formação de recursos humanos pelos membros das sucessivas diretorias do CELAFISCS neste período. Nas contribuições imateriais foram analisados os impactos da aproximação da ciência brasileira com os mais importantes cientistas e instituições do mundo, de projetos de promoção da atividade física, como o Agita São Paulo, além do compromisso social e da visão de futuro, que são características reconhecidas do CELAFICS. **Considerações Finais**: Os achados demonstram que nesses 50 anos, o CELAFISCS teve distribuição equitativa por gênero, predominância de formação em educação física e elevada proporção de membros com envolvimento com a pesquisa. O CELAFISCS gerou contribuição altamente significativa para as Ciências do Esporte e da Atividade Física no Brasil, tanto na produção acadêmica quanto na formação de recursos humanos, fazendo jus ao necessário reconhecimento de sua essencial importância para o desenvolvimento dessas duas grandes áreas.*

Palavras-chave: *Grupo de estudo; Promoção da saúde; Educação.*

Introduction

In the academic field, the union of people towards scientific production can be motivated by different factors, such as career development, fulfillment of institutional obligations, and training of human resources[1]. Also, the motivation for doing science can be personal or scientific[2] However, the longevity of research groups probably depends on extra motivation to overcome the

intrinsic obstacles of doing science, making the benefits of collective action greater than their difficulties[3]. A characteristic potentially capable of generating extra motivation for the long-term maintenance of study groups is when the group is formed around an IDEAL. In other words, when the group is not formed around project objectives but around ideals that give identity to the group beyond its members. This seems to be the case with Center of Studies of the Physical Fitness Research Laboratory from Sao Caetano do Sul (*Centro de Estudos do Laboratório de Aptidão Física de São Caetano do Sul* – CELAFISCS).

The CELAFISCS was founded in 1974 (initially under LAFISCS) and, therefore, completes 50 years of achievements in the areas of sports science and physical activity (PA). CELAFISCS aims to: "bring together professionals from the areas of physical education, medicine, nutrition, physiotherapy, and other related areas, to promote research, disseminate knowledge and training human resources in the area of Sports Sciences, Physical Activity, and Health." (free translation)[4]. The CELAFISCS' "golden jubilee" has been celebrated throughout the year 2024 and had its biggest celebration over the 47th International Symposium on Sports Sciences (*Simpósio Internacional de Ciências do Esporte* - SICE), an annual meeting called by the CELAFISCS FAMILY as the "scientific Christmas" of sports sciences and PA in Brazil.

Evaluating a research group's contributions is a complex, multidimensional, and unfinished task. Possible approaches include surveying tangible and intangible contributions, as UNESCO defines these terms[5]. Therefore, we aimed to describe tangible contributions linked to the objective traditions of scientific production and intangible contributions of CELAFISCS with its particular metrics (i.e., collaborative networks, recognition awards, promotional campaigns, etc.).

Methods

Aiming to add to previous publications by CELAFISCS members[6,7], it was decided to have authors exclusively by non-CELAFISCS members, to update previous surveys, and to include new metrics in the evaluation. Documentary research was carried out, including texts from the official website, prior publications, lectures given by members, and oral or written reports. To obtain the names of the members of all CELAFISCS boards over these 50 years, we used minutes of meeting records, written reports, and the official website.

To assess the tangible contributions, a search for members' CVs was done on the Lattes platform, the official CV registration platform of the Brazilian federal government (www.lattes.cnpq.br). Considering that "The Lattes CV has become a national standard for recording the past and current lives of students and researchers in the country, and is now adopted by most funding institutions, universities and research institutes in the country" (free translation)[8], the criterion adopted to determine whether the members had, or have, a link to research was whether or not they were registered on the Lattes platform. Board members were also characterized by gender and academic background. Then, the number of articles, books, and book chapters of board members and their human resources training activities (mentorships) were assessed. Regarding intangible contributions, documentary records of activities, events, and reports associated with technical and scientific production of CELAFISCS were used, in addition to the personal experiences of the authors, some of whom have long academic careers in the area and have directly or indirectly collaborated with CELAFISCS.

Historical aspects

The group was founded in 1974 by two young researchers, Victor Keihan Rodrigues Matsudo and Ana Maria Paes A. Tarapanoff, who were interested in understanding the variables of growth and development of schoolchildren in the city of São Caetano do Sul and, simultaneously, thinking about training human resources for sports science in Brazil[4,9]. The Center operates as a non-profit, independent social organization with the "Basic Training Internship in Sports Science Research" as its main entry point. In addition to the two founders, the first interns were Carlos Gomes Ventura, Maria Auxiliadora V. Peres, Sandra Caldeira, and Tsunioshi Tanaka[4]. Over the past 50 years, this internship program has trained more than 340 people (±7/year).

In Brazil, research groups are predominantly structured in educational institutions, primarily public higher education institutions. Usually, those groups seek to register in the National Council for Scientific and Technological Development of Brazil (*Conselho Nacional de Desenvolvimento Científico e Tecnológico* - CNPq) Research Group Directory, given that this Directory "...constitutes the inventory of scientific, technological and innovative research groups active in the country." (free translation)[10] and has demonstrated a significant growth in registrations in the last 20 years[11]. In this

respect, CELAFISCS is unique, as it has survived for 50 years without any official connection to the federal public system of research groups in Brazil. This is a fact to be reflected upon, considering that one of Brazil's most influential groups in the sports sciences and PA has operated independently and productively throughout his 50 years.

Notably, the work of its members, from interns to its president, is voluntary, with a dedication of ≈15/hours/week[9]. Ten members of the successive boards have participated, or still participate, for more than ten years in CELAFISCS, with emphasis on Dr. Victor Matsudo, who has been at the Center for 50 years, and on Prof. MSc Luis Carlos de Oliveira, with 31 years of contributions. In this scenario, it is necessary to extend the comment on Dr. Victor Matsudo. The best way to do so is perhaps by recognizing that Dr. Victor has a prominent role in CELAFISCS to such a degree that you could mistake one history for another. None of them would exist in the way they are known without one being the foundation of the other. Over these 50 years, Dr. Victor Matsudo has held different positions at CELAFISCS, mainly President or Scientific Director, while simultaneously providing unparalleled internationally recognized leadership, identifying and training new talents who went from being interns to being part of the board, and even occupying the presidency of the Center. This is the case of Carlos Roberto Duarte, Nanci Maria de França, and Timoteo Leandro Araujo, who, along with Dr. Victor Matsudo, served as CELAFISCS's President in different periods during these 50 years of existence.

On one side, Dr. Victor's Matsudo contributions are unique due to his longevity at the Center and his international leadership. On the other hand, CELAFSICS is known for carrying out science and interventions as a group. This is undoubtedly one of the main characteristics that give motivation, continuity, and support to the Center during this long period of existence. Because of this group characteristic, CELAFISCS is also known as the CELAFISCS FAMILY. To continue this historical overview, some relevant achievements of CELAFISCS must be highlighted. In 1978, CELAFISCS members and other professionals created the Brazilian College of Sports Sciences (*Colégio Brasileiro de Ciências do Esporte* - CBCE)[12]. Today, CBCE is a prominent scientific society in Brazil, which "... brings together researchers linked to the area of Physical Education/Sports Sciences." (free translation)[13], responsible for one of the most prestigious scientific journals in the area in Brazil, the Brazilian Journal of Sports Sciences (*Revista Brasileira de Ciências do Esporte* - RBCE) (https://www.scielo.br/j/rbce/), which CELAFISCS also created.

Another important fact for the consolidation of the area of sports science in Brazil was the creation, in 1987, in partnership with the ABC School of Education and Culture (*Faculdade de Educação e Cultura do ABC* - FEC), of the Brazilian Journal of Science and Movement (*Revista Brasileira de Ciência e Movimento* - RBCM) (https://portalrevistas.ucb.br/index.php/RBCM) as the official scientific journal of CELAFISCS, which is currently being published in partnership with the Catholic University of Brasília.

It is also important to mention that CELAFISCS was the Virtual Sports Center (*Centro Esportivo Virtual* - CEV) first partner through the AGITA São Paulo program (http://bit.ly/ce1997). With over 28 years of existence, CEV is Brazil's largest knowledge management *website* on physical education, sports, and leisure. The first appearances of CELAFISCS and Agita São Paulo on the internet took place in the CEV environment (https://ongcev.org/celafiscs1996 and https://ongcev.org/agita1996).

International recognition

CELAFISCS has received numerous significant awards over these 50 years, including the Philip Noel Baker Research Award from the International Council for Sports Sciences and Physical Education (ICSSPE), in 1995; the Prince Faisal Award in 1996; the 1999 Fédération Internationale d'Education Physique (FIEP) Presidential Award, the 2002 American Association for World Health Award for World Health Day, the 2004 Centers for Disease Control and Prevention (CDC) Physical Activity and Public Health Award, and the 2014 American College of Sports Medicine (ACSM) Citation Award. In addition to these, the La Caja Foundation for Sports Medicine and Health Promotion Award, on the occasion of the 1992 Barcelona Olympics, for the work related to the detection of sports talent based on the Z-Strategy, published in 1987[14,15]. References to other awards can be found on CELAFISCS's website (https://celafiscs.org.br/sobre-nos/) and in a previous publication[6].

Tangible contributions

Over these 50 years, 42 members have served on the

CELAFISCS boards, with a median tenure of 5 years. The longevity of the members of successive boards is potentially associated with the group's longevity, especially considering that participation is based on voluntary contributions. Notably, several former members maintained active collaboration with the Center, another indirect sign of the Center's aggregating power.

Of the 42 members of the boards, 20 are female (48%), demonstrating equality in the distribution of gender over the years. The editorial text of the proceedings of the 39th SICE, in 2016, drew attention to the fact that CELAFISCS is a group with a solid inclination to anticipate the future, or, as it is said, "to be ahead of its time"[16]. Is it a coincidence that, when looking at the distribution of gender of the members of successive boards over these 50 years, we find almost absolute equality between males and females? This is likely another sign of anticipation of trends. In periods when the discussion of gender equality was not raised as it is seen today, CELAFISCS already had this balance in its essence. The initial composition of the Center reinforces this interpretation: a man and a woman created the Center, and out of the four other first interns, two were female, and two were male. Oliveira et al.[7] and collaborators identified the same trend of equal distribution by gender among interns and instructors during the first 20 years of CELAFISCS. The discussion of gender equality is much broader and complex. Still, from a historical point of view, the equal distribution between male and female members in a scientific research group is essential to note.

As mentioned, registration on the Lattes platform was used as a criterion for establishing the link between CELAFISCS members and research. Among the 42 members, 33 (79%) are registered on Lattes, demonstrating the relationship of practically 4/5 of the members with research. Among those registered on the Lattes platform, 29 members (88%) have graduate degrees, 2 have lato-sensu postgraduate degrees at the specialization level, 10 have master's degrees, 11 have doctorates, 6 have post-doctorates, and 2 have habilitation degrees, reinforcing the vital link of CELAFISCS board members with scientific research.

Regarding the academic training at the undergraduate level, the most prevalent one was in physical education (60%), in addition to nutrition, medicine, physiotherapy, psychology, and others. This finding is slightly lower than what was observed among interns and instructors at CELAFISCS in its first 20 years when the prevalence of training in physical education was 84.5%[7]. However, it remains consistent with the group's description when it is characterized by actions that "... bring together professionals from the areas of physical education, medicine, nutrition, physiotherapy, and other related areas" (free translation)[4].

We also sought to assess CELAFISCS's contribution to science through the scientific productions of members of successive boards. The productions described below were not necessarily made during the members' tenure at CELAFISCS. However, the strong ties to research, the fact that the gateway to the Center is through a basic research internship, and the usual continuity of collaboration of former members with the Center supports the understanding that these contributions can be attributed, at least in part, to CELAFISCS itself. The total production of these members (before, during, or after their formal ties with CELAFISCS) is 2056 articles. Of these, 32% were published in journals with Journal Citation Reports (JCR), one of the various ways to indirectly assess the quality of scientific journals. Of note, journal quality indicators reflect a more recent trend that was not so present over the 50 years of scientific production of the Center. The publication of 103 books and 241 book chapters was also identified from the members' Lattes CVs. It is understood that the quantity and diversity of publication forms constitute acceptable indicators of the significant academic production of CELAFISCS for the sports sciences and PA.

Another highly relevant tangible contribution is the participation of CELAFISCS members/former members in training human resources for research (mentorships). Again, it is essential to emphasize that many of these contributions are indirect since they occurred after formal ties with CELAFISCS. This characteristic is also a consequence of the fact that several former interns became board members and/or pursued academic careers. In any case, the contribution of CELAFISCS seems clear to us, given the daily experience of the board members with research, with the guidance of new interns, in addition to the fact that, for many, their first contact with research occurred in the CELAFISCS environment. In this context, our survey shows that the members of the different boards supervised, until August 2024, around 1000 undergraduate and more than 200 graduate-level studies (Figure 1).

Furthermore, until 2021 (latest available data), these members were responsible for training 346 young re-

searchers in the annual "Basic Training Internship in Sports Science Research" program, the gateway to CELAFISCS.

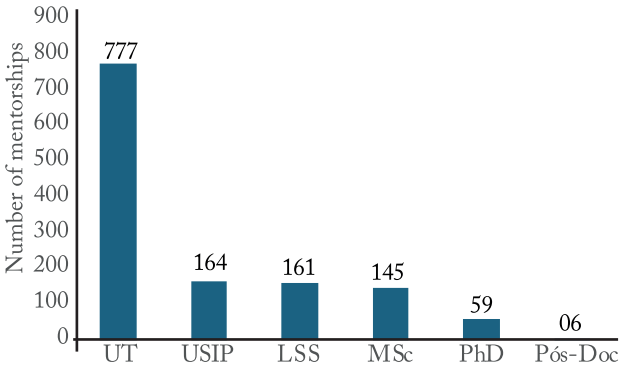

Figure 1 – Number of academic supervisions carried out by members and former members of successive CELAFISCS boards throughout its 50 years.
UT = undergraduate thesis; USIP = undergraduate scientific initiation program; LSS = lato-sensu postgraduate degree at specialization level; MSc = master's degree; PhD = doctorate; Post-doc = post-doctorate

Intangible contributions

By analogy with the cultural heritage concept, this text uses intangible contributions to refer to contributions that cannot be directly and objectively identified as scientific production or those that can be measured and eventually recognized indirectly. Another possible definition for these contributions with their specific metrics is the one presented by Keller et al.[17] when addressing how to evaluate intangible contributions to innovation. Also, Petersen et al.[18]. validate this methodology for scientific contributions derived from research with digital media.

Thus, we use these theoretical legitimations to the extent of the definition of innovation as the implementation of a new or significantly improved product (good or service) or process, a new marketing method, or a new method of organization in business practices, organization of the workplace or external relations[17]. Over these 50 years, CELAFISCS has been innovative in products or services developed (e.g., an internship in basic training, the 40' test, the Agita São Paulo Program) or in organizing its practices as an independent civil entity focused on science.

One of the outstanding intangible contributions of CELAFISCS has been the effort and pioneering spirit in continuously bringing great international leaders in the areas of sports science and PA to Brazil, especially in the various editions of SICE or in technical visits and training courses given by these world experts. This continued and long-lasting action had a clear impact on the rapprochement of Brazilian science with the international one, contributing not only to the internationalization of Brazilian research but also to its "humanization" in the sense that it provided young national researchers with the opportunity to have direct contact with those who were no longer just "authors of articles," but people sharing science and, in many cases, becoming future mentors or collaborators of national researchers. The Center managed to bring together leading personalities linked to the most prestigious research and teaching institutions in the world, who were at the forefront, for example, of international recommendations on PA for health or of organizations such as the ACSM, the US CDC, the World Health Organization (WHO) and the ICSSPE. As an example of expanded lists that can be accessed from other sources[6,7], and to minimize the inevitable awkwardness of including some and not others, it was decided to mention only a few icons with solid links to CELAFISCS among those who are no longer with us, and among those listed as international guests of the 47th SICE and those awarded as CELAFISCS´S Honorary Members. So, we mention, *in memoriam,* Per Olf Astrand, a CELAFISCS´ International Honorary Member, from the Karolinska Institute in Sweden, considered by many as the "Father" of exercise physiology; Bengt Saltin, co-founder of the European College of Sports Medicine, who worked at the Karolinska Institute and coordinated the Copenhagen Muscle Research Centre (CMRC); Ralph S. Paffenbarger Jr., a worldwide recognized epidemiologist, Harvard University professor and principal investigator of several classic studies, such as the Harvard Alumni Health Study; Steven Blair of the Cooper Institute in the US and the University of South Carolina, a CELAFISCS´ International Honorary Member; and Harold W. (Bill) Kohl, III, of the University of Texas Science Health Center in Houston, who also worked at the Cooper Institute and the CDC and is also a CELAFISCS´ International Honorary Member. Along with the above-mentioned, we include below the list of the International Honorary Members of CELAFISCS until today, in alphabetic order: Adrian Bauman – Australia; Antonio Pozas Ramos – Cuba; Barbara Ainstowrth – EUA; Benjamin Massey – USA (*in memoriam*); David Montgomery – Canada *(in memoriam*); Fiona Bull – Australia; I-Min Lee – USA; James F. Sallis – USA; James Skinner – USA; James Whitehead – USA; John

Andrews – England (*in memoriam*); Marcel Hebbelinck – Belgium; Michael Pratt – USA; Oded Bar-Or – Canada (*in memoriam*); Paavo Komi – Finland (*in memoriam*); Richard Boileau – USA; Robert Malina – EUA; Steven John Fleck – USA; Scott Powers – USA; Werner Sonnenshein – Germay (*in memoriam*); William Haskell – USA; Willian Dexter – USA. A more comprehensive list, also including the Brazilian Honorary Members can be find at www.celafiscs.org.br and on the SICE booklets.

To the international guests of the 47th SICE (2024), a brief statement on how they perceive the contributions of CELAFISCS over these 50 years was requested as follows:

- - **Stella Lucia Volpe**, PhD, RDN, ACSM-CEP, FACSM – Current President of the ACSM: *"CELAFISCS has been a major contributor to physical activity and overall health. They have implemented major initiatives to keep people moving and healthy.* Congratulations *on your 50 years of movement and health, CELAFCISCS!*"
- - **James S. Skinner**, PhD, FACSM - Professor Emeritus, Indiana University – USA: *"I have known Victor for more than 50 years, so I have seen the major impact of the research, education and service by Victor and Sandra and so many others who have worked and studied at CELAFISCS. The Golden Jubilee Symposium is a living tribute to the outstanding contribution of all the people at CELAFISCS to Brazil, Latin America, and the world. I am especially honored to be a part of this celebration."*
- **James F. Sallis,** Ph.D., Professorial Fellow, Australian Catholic University, Melbourne; Distinguished Professor Emeritus. Herbert Wertheim School of Public Health and Human Longevity Science - University of California, San Diego – "*CELAFISCS has been successful in building research capacity for PA for decades, greatly expanding the number of excellent researchers and quality of evidence from Brazil. I have been impressed at the continuous evolution of CELAFISCS, from sports performance, to chronic disease prevention, to population-wide promotion, to active design of communities. CELAFISCS is the spark that led directly to global impact through Agita Mundo and World Physical Activity Day*."
- **I-Min Lee**, MD, ScD, Professor of Medicine, Harvard Medical School, Professor of Epidemiology, Harvard T. H. Chan School of Public Health – "*Physical activity is so important for our health, function and well-being; thus, we need to promote this healthy behavior widely. CELAFISCS is to be commended for making an enormous contribution by training professionals in this field for a half century*."
- **Steven J. Fleck**, PhD, FACSM, FNSCA, CSCS*D - "*Over the last 50 years CELAFISCS has had a tremendous impact on the physical fitness and health of people throughout Brazil, South America and the world. This has been accomplished by performing research, sponsoring symposia and programs for professionals in the sport sciences and for the general population on a wide range of topics related to the positive effects of PA on health-related outcomes for all ages. Congratulations CELAFISCS on 50 years of excellent work.*"
- **Sandra Mahecha - Matsudo**, MD, Ph.D. - Faculty of Medicine and Health Sciences, Universidad Mayor; Center for Research in Sports Medicine, Exercise and Health-Clínica MEDS, Chile; former member of the Board of Directors of CELAFISCS – "*Among the contributions of CELAFISCS, I highlight Agita São Paulo, which was undoubtedly the best contribution we made. We started in 1994, when the importance of PA was still unknown. Once again, we were ahead of our time thanks to Dr. Guedes' vision and the challenge of the team that took on this task from scratch, literally! I would also like to highlight that we innovated by launching a first in Brazil in the area of aging, with my doctoral thesis on the Longitudinal Project on Aging and Physical Fitness in São Caetano do Sul as a milestone, followed by other unprecedented actions such as the books on physical and functional assessment of the elderly and on exercise and aging, in addition to the *Sênior Fit* proposal and an innovative project for PA intervention in elderly people in long-term care facilities in São Caetano do Sul, boosted by two consecutive Talentos da Maturidade awards from Banco Santander. For all this, and much more, I am proud of this organization and congratulate CELAFISCS on its 50th anniversary!*"

Notably, some scientific contributions of CELAFISCS were also included among the intangible ones due to their impact on human resources training or for going beyond Brazilian borders. Among those, we highlight the 1977 development of the "40 seconds Test" as a proposal for assessing total anaerobic power. This is a practical demonstration of

CELAFISCS' philosophy of seeking methods, protocols, tests, and assessments with scientific accuracy, low cost, and, therefore, greater possibility to be used in different needy scenarios in sports sciences[6], as observed in many regions of Brazil and Latin America. The test has proven to be "...a practical and sensitive proposal for indirect measurement of anaerobic power."[19] In 1983, CELAFISCS, through psychologist Sandra Mara Cavasini and Dr. Victor Matsudo, presented the validation of an adapted subjective effort scale, with a range of 0 to 10 points, as an alternative to Borg's original scale, which ranges from 6 to 20 points, under the argument of seeking a scale closer to Brazilian culture, more familiar with the 10-point scale[12]. This adapted scale was, and continues to be, widely used in physical assessment protocols. In this same philosophy, CELAFISCS validated a methodology for self-assessment of sexual maturation in children. The results showed that the method "...is simple and does not seem to require a special evaluator (physician). It can be applied to both sexes, during the peripubertal phases, even at different socioeconomic and cultural levels..."[20,21]. Another noteworthy contribution is the participation of CELAFISCS in the validation process of the IPAQ (International Physical Activity Questionnaire), which is the only center in Latin America to participate in this cooperation. CELAFISCS was also responsible for validating the Portuguese version of the IPAQ[22], which significantly impacted research on PA and health in Brazil since it is possibly the most widely used questionnaire worldwide in studies on the prevalence of PA levels[23]. To conclude these examples, mentioning the Z-Strategy, published in 1987 in the Journal of Sports Sciences, is essential. The Z-strategy used for early detection of sports talents, which was awarded at a scientific congress on the occasion of the Barcelona Olympics in 1992, is based on a simple statistical principle (Z index), which allows determining how much the evaluated person deviates from the population normality in standard deviation units, thus being able to identify those with outstanding physical qualities for specific sports[14,24]. Returning to the definition of innovation presented above, it seems clear to us that the "40-second test", the "Subjective effort scale on a 0-10 point scale", the proposal for "self-assessment of sexual maturation," the validation of the IPAQ for Portuguese and the "Z-Strategy" as a scientific method for detection of sports talents, are new products/processes or significant improvement of what already existed, that is, innovations resulting from CELAFISCS' contributions.

Another intangible contribution is CELAFISCS' continuous provision of update or development courses, emphasizing the 1st International Course on Physical Activity and Public Health – Agita Mundo, in 2004, in the city of Ilhabela. This was the first course outside the US along the lines of the traditional course offered in partnership by CDC and the University of South Carolina in the US. This one-week immersion course featured prominent international speakers (Michael Pratt, Adrian Bauman, and Bill Kohl) and pioneering leaders in Brazil (Markus Nahas, José da Silva Guedes, Victor Matsudo, and Sandra Mahecha-Matsudo). Fifty-eight professionals from nine states in Brazil were trained, in addition to international participants, many of whom are now leaders in research and PA promotion.

Despite the difficult task of identifying the most significant intangible contribution of CELAFISCS, it is very likely that the creation of the Agita São Paulo Program[25,26] would be identified as such by the academic community in the area. Created based on a demand from the then Secretary of State for Health of the State of São Paulo, Dr. José da Silva Guedes (in memoriam), the Program was created by CELAFISCS in 1996 and has been coordinated by it ever since, bringing with it other achievements such as the creation of the Agita Mundo Network and the Physical Activity Network of the Americas (RAFA-PANA)[27]. The Program was born with the bold intention of combating sedentary lifestyles and promoting PA throughout the state of São Paulo. It has remained productive for over 28 years, often without the resources that allowed its creation and sustainability for approximately 20 years.

The creation of Agita São Paulo coincides with the period in which CELAFISCS began to progressively and innovatively incorporate the theme of PA and health beyond its initial tradition, more focused on sports, performance, physical fitness, and physical assessment. This theme change is also, *per se*, another intangible contribution of CELAFISCS, as it influenced other research and intervention groups in Brazil. It should be noted that the central themes defined for each edition of SICE already indicate this trend. In 1982, the theme was "Women and Physical Activity". It is significant to note that the concept of PA as we know it today was formally defined only in 1985 by Caspersen et al.[28]; therefore, three years after CELAFISCS used it as the central theme of SICE. In

1985, the term appeared again as "Youth and Physical Activity", and, most notably, in 1998 the theme was: "Physical Activity: Passport to Health".

Still among the intangible contributions, it is essential to note the contributions of the 46 editions of SICE held to date, which were added to the 47th edition of this Golden Jubilee celebration. The SICE, or CELAFISCS Symposium, or CELAFISCS year X, as many refer to this great scientific event, has effectively immeasurable repercussions, whether through the opportunities for sharing knowledge, for bringing together established researchers with the new generations, for high-quality scientific updates, or the establishment of partnerships. SICE is a fundamental event on the agenda of everyone involved with sports sciences and PA in Brazil and other countries. SICE is one of the main ways CELAFISCS has contributed and continues to contribute to the internationalization of these areas in Brazil. It is worth noting that, using a conservative approach, it is estimated that approximately 15,000 participants have attended the 46 previous editions of SICE and was joined the 482 registered ones for this 47th edition.

Another intangible contribution, which time has shown to be part of the DNA of CELAFISCS, is its vision of the future, sometimes even anticipating paradigm shifts. Paradigms and guiding concepts of a scientific area do not tend to change frequently. However, this is different in the area of PA and health, which has undergone rapid conceptual and technological development in recent decades[29,30]. As examples of CELAFISCS' vision of the future, one can mention the need to advance the concept of PA beyond sports and exercise and the importance of moderate and accumulated PA when the idea of continuous and vigorous exercises still predominated. The same happened years later with the notion of the benefits of light PA and sedentary time breaks. More recently, CELAFISCS also anticipated the message that any PA is better than none, with its "Every Step Counts" campaign launched in 2018, two years before the World Health Organization incorporated it into its 2020 recommendations[31]. In short, whether from vigorous to moderate, from moderate to light, from continuous to accumulated, or from some activity to none, CELAFISCS has demonstrated the ability to anticipate trends in upcoming scientific evidence, thus drastically impacting both research and health promotion in Brazil and abroad. Perhaps the best example of this anticipatory capacity is the observation, back in the 1990s, that most of the possible benefits of abandoning inactive lifestyle towards a regularly active life occur in the first stage of change. Around 1995/1996, CELAFISCS members presented a schematic figure at conferences, classes, and lectures, which became known to many in the field (Figure 2). The diagram illustrates that leaving inactivity and accumulating some PA provides about 2/3 of the total expected benefit. According to reports by Dr. Victor Matsudo, this figure was drawn up based on the evidence available at the time and simple statistics using proportion calculations. The adequacy of this concept was progressively evidenced until this year of the "golden jubilee" when prominent international authors published an article in one of the leading scientific journals showing a very similar result but, this time, based on improved methodological and statistical approaches. The data, based on a representative sample of American adults ≥40 years of age and with PA assessed by accelerometry and the level of PA divided into quartiles, demonstrate that considering the mortality outcome, about 66% of all the benefits achieved by the most active individuals (quartile 4) occurs from the first to the second quartile of PA[32].

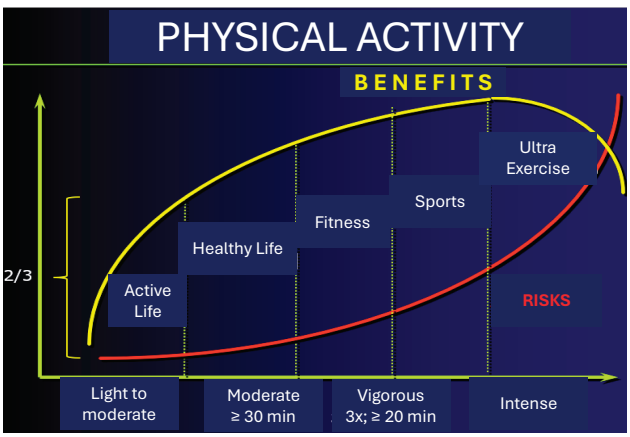

Figure 2 – Illustrative diagram provided by CELAFISCS, whose original format dates from 1995/1996, indicating that around 2/3 of the benefits of a regularly active life occur when inactivity is abandoned to accumulate some physical activity (represented in the figure as the Active Life stage).

The last contribution to be mentioned among the intangible ones is the creation in 2021 of the Manifesto to Promote Physical Activity in Post-COVID-19: An International Call for Urgent Action[33]. At a time of great uncertainty in the face of the COVID-19 pandemic, CELAFISCS's vision of the future once again allowed the meeting of a Committee of Brazil-

ian researchers and scholars from different regions of the country to discuss the potential role of PA in those circumstances. After almost a year of work with often weekly meetings, the group presented a document with 12 calls for action during the 43rd SICE in October 2020. This document received support from more than 600 institutions in Brazil and abroad. It was published in the *Revista Brasileira de Atividade Física & Saúde* in Portuguese, English, and Spanish, as well as other media[34]. As a result of CELAFISCS's leadership, this Committee decided to maintain its activities. It has defined new annual goals since 2021 and has regularly met every two weeks over the past four years. It is noteworthy how CELAFISCS has managed to maintain a group of leaders in PA science and health in Brazil for so long and on a regular and voluntary basis. Over this period, the Committee has produced an eBook and several video casts focused on conditions linked to long Covid and has just launched at this 47th SICE a new book, The Agito Challenge; this time focused on promoting PA for children.

Several other intangible contributions could indeed be listed here, such as the Ilhabela Longitudinal Project[35], the ISCOLE project[36], the Longitudinal Project on Aging and Physical Fitness of São Caetano do Sul[37], and the Mobile Management of the Ecological Model[38], among others. Even though the restrictions of a preliminary review of the present study impose limitations that require the establishment of choices, the Ilhabela and the São Caetano Aging projects deserve brief comments considering their impact on CELAFISCS´s publications (papers and books) that are important references that inspired many young researchers and undergraduate students. The Ilhabela project is a mixed longitudinal Project, established in 1978, focused on the growth, development, and physical fitness of schoolchildren. Ilhabela is a coastal city in the state of São Paulo in which CELAFISCS's team goes twice a year (April and October) for uninterrupted data collection since 1978, allowing trend analyses that have shown, among other impressive results, trends of increase in adiposity and reduction of physical fitness of children. An outstanding methodological aspect that must be highlighted is that during more than 40 years of the project's existence, the same researcher (Dr. Victor Matsudo) collected all data on skinfolds and bone diameters. The São Caetano Aging Project, in turn, is a pioneering study in Brazil established in 1996 and aimed at analyzing the impact of aging on anthropometric, physical fitness, PA, and psychological variables of older women from the community of São Caetano do Sul. Among other contributions, the results arising from this project resulted in the CELAFISCS's Senior Fit Project – a two-year intervention program in long-term care institutions that contributed to countless senior citizens who were initially confined to bed to regain some physical autonomy and more active citizenship.

Study limitations

This text is intrinsically incomplete, whether due to methodological limitations to broaden its scope or to the choice of specific approaches to evaluate a research group's scientific contributions, which will undoubtedly benefit from other additional and/or discordant approaches. So, given the importance of CELAFISCS to Sports Sciences and Physical Activity in Brazil and around the world, it is recommended that this study be reviewed and complemented by future ones.

Another limitation is the decision to evaluate tangible contributions based on the Lattes CVs of board members. Despite being the official platform for registering Brazilian researchers, reports of people whose CVs need to be updated or who have stopped including publications after leaving the formal education system are common. Thus, it must be admitted that the survey conducted here tends to underestimate the total academic production and the mentorships provided. We also considered compiling data from Scopus, Web of Science, or Google Scholar databases. However, some of these are restrictive regarding the indexed journals, and, in the case of Google Scholar, we noticed that a significant number of members were not registered. Regarding tangible contributions, it should be noted that it was not possible to disregard duplicate papers since publications with more than one author are common. It should also be noted that all tangible contributions described here refer only to those linked to members who have been part of the CELAFISCS boards over the past 50 years. Including the more than 346 CELAFISCS' former interns was beyond our scope but would significantly increase the quantitative data observed here.

The lessons learned from this study require us to recommend that current members and all those in some way connected to CELAFISCS deepen the assessments that are already routinely carried out by the Center with the help of its group of Scientific Advisors to establish strategies for its continued and growing subsistence in

the years to come. Using the words of The Little Prince, by Antoine de Saint-Exupery: "Tu deviens responsable pour toujours de ce que tu as apprivoisé", with a free English translation to: "You become responsible, forever, for what you have tames"[39]. CELAFISCS has been captivating the Sports and Physical Activity Sciences for the last 50 years and, thus, has become responsible for this invaluable contribution!

Final considerations

The rationale for the text is based on the understanding that, as part of the Sports Sciences and Physical Activity community, it was our duty to draw the attention of Brazilian and international societies to the outstanding contributions of CELAFISCS to these fields. Indeed, these contributions go beyond the limits of these two areas since they extend to two other significant areas of our society: health and human resources training.

In summary, with an equal gender distribution, a predominance of physical education training, and a high proportion of involvement in research, the individuals who have served on the successive boards of CELAFISCS have made highly significant contributions to science, PA promotion, and human resources training. Therefore, considering reports that the time spent at CELAFISCS was the first or most impactful contact for many with science, the long tenure of several at CELAFISCS, and the continued partnership of many former members with the Center, it is pertinent to attribute these contributions, even if in part, to the role that CELAFISCS played in their careers and, therefore, to attribute to CELAFISCS a highly relevant contribution to Sports Sciences and Physical Activity in Brazil.

This tribute could not concluded without recalling the five "Cs" that characterize this very unique Study Center: Competence, Commitment, Cohesion, Creativity, and Heart, which also starts with a "C" in Portuguese (*Coração*)[40]. These five "Cs" are, most likely, the driving force that has successfully sustained CELAFISCS throughout these 50 years, allowing its IDEAL to be much more than they postulate: "to promote research, disseminate knowledge and train human resources in the area of Sports Sciences, Physical Activity and Health." (free translation)[4]. CELAFISCS has indeed been an organization that TRANSFORMS LIVES, and, thus, HAS TRANSFORMED OUR SOCIETY toward a more active, healthier, and, therefore, fairer society.

Finally, it is essential to remember that institutions are made up of people. Therefore, CELAFISCS' contributions were made by people who dedicated themselves to the IDEAL of this Center in different generations. So, we hope the CELAFISCS members will keep dreaming together because, as Dr. Victor Matsudo always calls attention: "Dreaming alone will make you go faster, but by dreaming together, we will go further." As members of the scientific community of Sports Sciences and Physical Activity, we say: THANK YOU VERY MUCH and LONG LIVE CELAFISCS!

Conflicts of interest

The authors Porto LGG, Pereira LE and DaCosta LP are honorary members of CELAFISCS, members of the Committee of the International Manifesto for the Promotion of Physical Activity in Post-COVID-19 Period: Urgent Call for Action and scientific advisors of the Agita São Paulo Program. The other authors have no potential conflict of interest to declare.

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Author's contributions

Porto LGG: Conceptualization; Methodology; Validation; Formal analysis; Investigation; Resources; Data curation; Supervision; Project administration; Funding acquisition; Writing – original draft; Approval of the final version. Molina GE: Conceptualization; Methodology; Writing – review & editing; Approval of the final version. DaCosta LP: Methodology; Writing – review & editing; Approval of the final version. Ramos IL: Methodology; Formal analysis; Investigation; Data curation; Writing – review & editing; Approval of the final version. Vargas FD: Methodology; Formal analysis; Investigation; Data curation; Writing – review & editing; Approval of the final version. Pereira LE: Conceptualization; Investigation; Writing – review & editing; Approval of the final version. Costa AP: Conceptualization; Methodology; Formal analysis; Supervision; Writing – review & editing; Approval of the final version.

Declaration regarding the use of artificial intelligence tools in the article writing process

The authors did not use artificial intelligence tools for preparation of the manuscript.

Availability of research data and other materials

The contents underlying the research text are contained in the manuscript.

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Reviewers' assessment

The reviews of this article were originally conducted in Portuguese. This version has been translated using ChatGPT and subsequently reviewed by the Chief Editors.

Reviewer A

Pedro Curi Hallal
University of Illinois Urbana-Champaign, United States.

- Was there any indication of plagiarism in the manuscript?
  No
- Did the authors provide clarifications regarding the ethical procedures adopted for conducting the research?
  Not applicable
  Comments to the author
- I have nothing to comment, except to congratulate the authors and CELAFISCS for these 50 years of history. Congratulations also to RBAFS for providing space for such an important publication, recognizing a history that is so essential to the development of the field of physical activity and health in Brazil.

Final decision

Accepted for publication in its current format.

Reviewer B

Edilson Serpeloni Cyrino
State University of Londrina: Londrina, Paraná, Brasil.

- Was there any indication of plagiarism in the manuscript?
  No
- Did the authors provide clarifications regarding the ethical procedures adopted for conducting the research?
  Not applicable
  Comments to the author
- The article describes the historical trajectory of the Centro do Laboratório de Aptidão Física de São Caetano do Sul (CELAFISCS). While many important pieces of information are presented throughout the text, I felt there was a lack of greater depth regarding the Classic Research Projects conducted by CELAFISCS, including the Ilha Bela/SP Project and the Aging Project developed in São Caetano do Sul/SP. These projects gave rise to the main and most well-known books produced by CELAFISCS, which have been widely used by young researchers and, especially, undergraduate students.
- The gallery of CELAFISCS presidents also deserved to be highlighted for their intense work dedicated to Sports Sciences in Brazil. Finally, I believe the list of international researchers who attended the editions of the event should be expanded, as many of them made singular and significant contributions to the field of Sports Sciences and deserve to be remembered for their participation in the International Symposium on Sports Sciences (SICE).

Final decision

- Minor revisions required.