

A BIOMECHANICAL RESEARCH IN BRAZIL: SURVEY OF LABORATORIES AND RESEARCH, MAINLY THE BALANCE AND POSTURE AREA

Jonas Gurgel*, Flávia Porto*, Fabiano Gonçalves, Thais Russomano, Antônio Carlos Araújo de Souza*

Aerospace Biomechanics Research Group, PUCRS, Porto Alegre, Brazil
* Institute of Geriatrics and Gerontology, PUCRS, Porto Alegre, Brazil

The aim of this study was to present the profile of the Brazilian labs currently conducting researches in Biomechanics. The sample was selected based on the list of labs and research groups published by the Brazilian Society of Biomechanics. The results have shown that human gait, balance and posture are the most studied areas among the participating labs. The coordinator's interest appears as a fundamental factor in the choice of those lines. Most of them admitted to having received some sort of financial or material support from public and/or private establishments for the research development. It was also demonstrated that research labs have been evaluating sedentary young adults, between 19 and 30 years old. It's believed that this study may motivate the restructuring of the Brazilian Biomechanics' knowledge.

KEY WORDS: biomechanics research, survey research, Brazilian research labs.

INTRODUCTION:

Scientific research in Biomechanics has increased in Brazil in the last few years. According to the Brazilian Society of Biomechanics (BSB), the number of participants in congresses promoted by BSB rose from 70 in 1988 to 423 in 2003 with a total of 218 papers presented in the last meeting (BSB, 2005a). Batista & Amadio (2005) believe that Biomechanics researchers have considerably improved their knowledge worldwide, including the Brazilian ones, from 1980 to 2003. These authors state that the creation of both the Brazilian Congress of Biomechanics (BCB, previously named National Encounter of Kinesiology and Biomechanics Professors) and the Brazilian Journal of Biomechanics (BJB) were decisive elements in the expansion and divulgation of this area of study in Brazil.

This study aimed to present and analyse the Brazilian research biomechanical laboratories registered at the BSB, considering the evaluation of the research lines offered, the infra structure of the labs and the subject of study per laboratory.

METHOD:

Data Collection: This is a descriptive research based on a survey method. According to Thomas & Nelson (2001), this method is appropriate when the aim is to investigate the actual practices (or opinions) of a population in a specific area. The type of questionnaire adopted was classified as partly-open, including therefore open and close questions.

The questions were related to (1) the research areas of the labs; (2) the financial or material support existing for research development; (3) the instruments available for biomechanical analysis; (4) the biomechanical instrumentation areas under study; and (5) labs dedicated to study balance and posture, especially evaluating the profile of the population studied.

The questionnaires were sent by e-mail after the participant had agreed either by phone or email to take part in the study.

The sample was composed of Brazilian labs and research institutions that develop and spread out scientific studies in Biomechanics in Brazil. The sample was selected based on the list of labs (LL) and research groups published by the Brazilian Society of Biomechanics (BSB, 2005b).

Data Analysis: The total number of answers was determined by simple addition. Responses had equal weight.

RESULTS:

The list had 26 labs. It was possible to contact 22% of them. A total of 15 questionnaires (55%) were sent, but only 7 responded and sent the questionnaires back, which represents 25,92% of the list.

The results demonstrated that 3 of the 7 participating labs do not conduct research only in Biomechanics. They also have studies in other areas, such as Anthropometry, Ergometry, Motor Control, Neurophysiology, Electromyography and Ergoespirometry.

Research lines at the labs are defined 100% by the coordinator's interest, being followed by the student's interest and the availability of the equipment (both 57,14%). The vast majority of the coordinators who responded that they only conduct research in Biomechanics, indicated that the availability of equipment is the major determining factor that motivates them towards a specific line of research. One of them, however, based his motivation on the integration among the research lines of the lab. The results also showed that the cooperation with other groups and entities (State and Federal Agencies and private companies) that offer support to the development of studies or the maintenance of the laboratories was an important factor for the majority of the laboratories (71,43%). The most common type of support was the payment of scholarships by the government (71,43%) and companies (28,57%). This was followed by the adoption of equipments and/or material for research (42,88%), financial support (42,88%) and the development of instruments (28,57%).

The nature and prevalence of the existing equipment in each laboratory evaluated are presented in Figure 1.

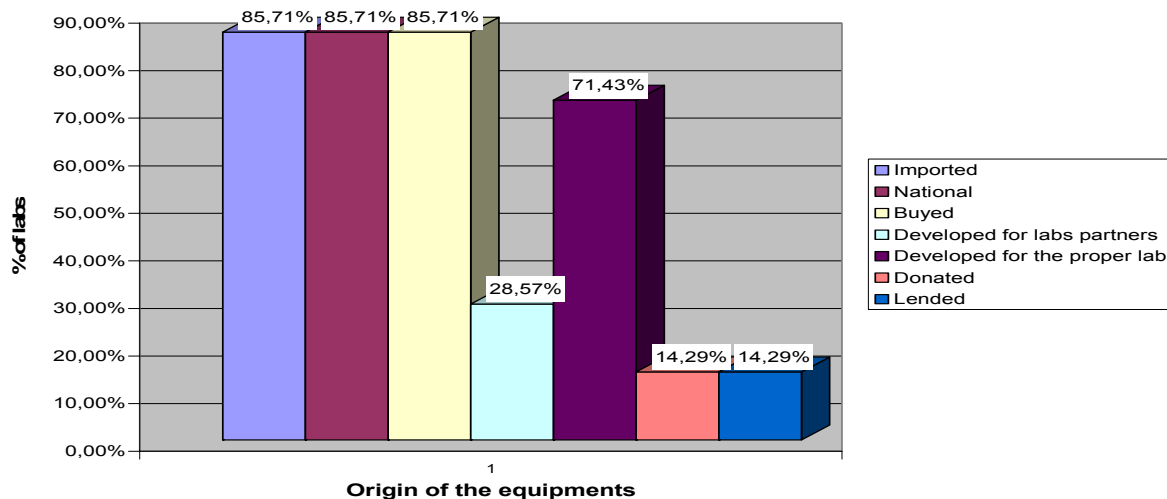


Figure 1 Source of the existing equipment in each lab evaluated

The main areas of research are shown in Table 1. Cinemetry based on video was found to be the main area of research.

Table 1 Main areas and sub-areas of instrumentation in Biomechanics in the labs

| Areas | Subareas | Proportion |
|-------------------------|--------------------------|------------|
| Cinemetry | Accelerometry | 57,14% |
| | Cinemetry based in video | 85,71% |
| | Goniometry | 57,14% |
| Anthropometry | Segmetation method | 42,88% |
| | Shadow Moiré Technique | 14,28% |
| | Reaction board | 14,28% |
| Electromyography | Surface | 71,43% |
| | Invasive | 14,28% |

The labs that use EMGpro in their researches also use EMG. Another biomechanics method, called the dinamometry, was very used by the researchers (85,71%).

The results related to the availability of the equipments and instruments are presented in Table 2.

Table 2 Equipments and instruments more cited in this study

| Equipments and Instruments | Percent |
|--|---------|
| Video Camera | 100% |
| Electromyograph | 85,71% |
| Photo camera, force plate | 71,43% |
| Passive marker, plumb line, pressure plantar plate | 57,14% |
| Acclerometry 1D, goniometer, electrogoniometer, pressure plantar insole, force cell, photo cell | 42,88% |
| Stabilometer, Accelerometer 2D | 28,58% |
| Shadow Moiré, postural grid, active marker, treadmill connected to a force plate, equipment isokinetic, jump board, footswitch, force plate to aquatic environment, accelerometer 3D | 14,28% |

DISCUSSION:

The small number of responses obtained during this study was an expected result, since it is not uncommon to have it when questionnaires are used as a research tool (Lakatos & Marconi, 1991; Thomas & Nelson, 2001). Some researchers did not respond because they believe that the answers could be found in their lab website, which can be a source of error since the web pages are currently not updated. Also, there were labs without homepages.

Researchers that stated that they do not conduct research exclusively in Biomechanics are the same ones that study either Neurophysiology or EMG. Ávila et al. (2002) defend the idea that EMG is also a biomechanical method of measurement.

It is believed that the cause for the main line of a lab to be the coordinator's interest is an advantage. A negative aspect, however, is that some areas can be neglected. It seems to

be the reason for the stimulation of studies in other areas by the BSB, which display them in their own web site (SBS, 2006c).

The origin of equipments acquired for the labs show the fragility of the sector in relation to financial support, and of the limited availability of material in the market.

According to Galembeck (2005), during the 70-80s, FINEP (one of the Brazilian finance agencies for research) investment in the acquisition of equipments and imported materials was essential for the development and motivation of Brazilian science and scientists, respectively. Nowadays, however, the increase in tax over imported materials has been seen as an obstacle for the development of many different research projects. The laboratories started to establish international co-operations to try to overcome this financial constraint (Batista, 1996).

Batista & Amadio (2005) have pointed out that the BSB list of Brazilian labs is not updated. As a good example, the Microgravity Center from the Pontifical Catholic University of Rio Grande do Sul (PUCRS) has established the Aerospace Biomechanics Research Group in 2004. This lab, however, is not listed despite the fact that the professionals of this group have consistently presented and published papers in this area, including the participation in the X and XI BCB. We believe that the BSB web site has to be frequently updated in order to promote the groups and the work that has been conducted in Brazil in the area of Biomechanics.

CONCLUSION:

This study aimed to present an overview of the Brazilian labs that are dedicated to conduct research projects in the area of Biomechanics. The results suggest that the labs are more equipped to study sport techniques. However, we hope that Biomechanics researches in Brazil, including studies that evaluate balance and posture, will also become an area of great interest and financial investment in the near future.

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