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EFFECT OF ANTROPHOMETRIC ASPECTS OF F56 CLASS ATHLETES IN THE PRESSURE DISTRIBUTION ON THE THROWING FRAME SEAT

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Abstract

Seated shot-putters use a customized sport assistive device called throwing frame. The main goal of the throwing frame is to assist in partial or full weight-bearing. The performance of athletes in stationary throwing events resulting of interaction between anthropometry aspects and design of throwing chairs. Comfort is critical as some athletes that have decreased or loss of sensory, motor, neuropsychiatric or metabolic functions may be prone to pressure sores due to time spent on the throwing frame and for training purposes. Measuring the pressure applied on the seat can help to understand the key points of interaction anthropometric aspects and throwing frame design for development new throwing frame. The purpose of this study was compared the pressure distribution in the throwing frame seat and adjustable anthropometric device in seated throwers with loss of sensory of F56 class. Three seated throwers average age of 23,33 ± 8,73 years, weight 56,33 ± 5.50 kgf with myelomeningocele of F56 class were evaluated randomly by a device assessment calibrated of pressure distribution FSR (Force Sensing Resistor) positioned on the seat. It was observed an increase in the pressure distribution on the seat the adjustable anthropometric device averaged 4,6 ± 0,16 Kpa compared with throwing frame seat with averaged 2,76 ± 0.15 Kpa. The pressure distribution in adjustable anthropometric device presented a balance pressure distribution in the two ischial regions and thigh while in throwing frame focused in a small area of one of ischium. Assessment load distribution considering anthropometric aspects of seated throwers can be a parameter in order to prevent pressure sores, improving comfort the seated throwers and help understand interaction interaction anthropometric aspects and throwing frame design for development a new throwing frame.

***Palavras chave**: Pressure distribution, anthropometric, throwing frame, athlete, F56*

1. INTRODUÇÃO

Seated shot-putters use a customized sport assistive device called throwing frame. The goal of the throwing frame is to assist in partial or full weight-bearing. Briefly, it is a scaffold-like chair made of metal bars and plates welded together (FROSSARD, 2010). The performance of athletes in stationary throwing events resulting of interaction between throwing technique (anthropometry, functional outcomes, strength, fitness) and design of throwing chairs (rules, sensations of comfort, local resources, height of the backrest). A change in one component within these aspects might have an impact on the other (O'RIORDON, 2006).

The seated throwers are divided for classification system and functional outcomes in classes 52 – 58. This class includes athletes of complete spinal cord lesion at L2-4 or equivalent impairments in upper limb, trunk function and some leg function. Usually, they have normal trunk control in the upwards, backwards and forwards and can use hip flexors to reinforce forward movement in the process of throwing (TWEEDY, 2009). This athletes have decreased or loss of sensory and motor that can cause tissue damage known as pressure ulcers, misalignment and degeneration, pain and discomfort with repercussions on the individual's functional capacity (COGGRAVE, 2003) .

Nowadays, the construction of each individual throwing frame is mainly driven by an empirical approach relying on the feedback from coaches and athletes as well as apparent functionality and comfort. Comfort is critical as some athletes that have decreased or loss of sensory functions may be prone to pressure sores due to time spent on the throwing frame for training purposes (FROSSARD, 2010).

Research in biomechanics has tried improving the understanding this interaction between the seated throwers and throwing frame for development a new throwing frame (FROSSARD, 2005). The purpose of this study was to compare on pressure distribution in the throwing frame seat and one seat with adjustable anthropometric device in athletes F56 class.

2. MATERIAIS E MÉTODOS

The sample was composed of three paralympic athletes class F56 from Paraplegics Association of Uberlandia (APARU). All of participants signed the informed consent and the work was approved by the ethics committee for research Conep (protocol 315/07).

The pressure distributions on seat were evaluated randomly in throwing frame and adjustable anthropometric device. In the adjustable anthropometric the seated_throwers were positioned considering anthropometric individual measurements. The assessments of individual anthropometric measurements were: leg length was measure the distance between popliteal fossa and feet base. The thigh length corresponded the distance between the popliteal fossa and posterior part of the buttocks. For measurements in both conditions athletes were asked to remain seated relaxed looking ahead.

The measurement on pressure distribution on the seat used an assessment calibrated device of load distribution FSR (Force Sensing Resistor) positioned on the seat. The measurement system consisted of 27 sensor arranged along the surface (340 x 340 mm) seat. This system shows a decrease in electrical resistance with an increase in the applied force on its surface. The acquisitions of signals in equivalents values of force were associated with the processing and visualization in interface by LabView® software (LANA, 2014) Figure 1.

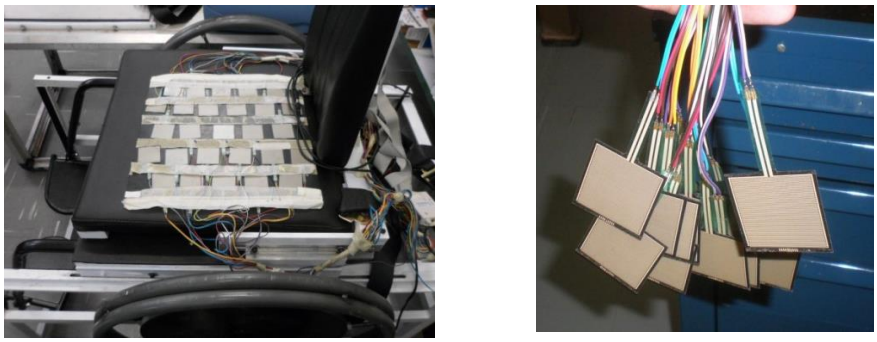

Figure 1- FSR (Force Sensing Resistor) positioned in seat and the sensor used in the system

The results of load distribution were analysed employing descriptive and inferential statistics. It was used SPSS software, version 19.1. Quantitative variables were described using mean and standard deviation. The paired test was used to verify the correlation between the variables of load distribution in the two seat positions. The level of significance was 5% (<0.05).

3. RESULTS

The sample consisted of 3 athletes class F56 (3 males) with the average age of 23,33 ± 8,73 years, weight 56,33 ± 5.50 kgf affected by myelomeningocele (Table 1).

Table 1- Profile of class F56 athletes used in sample

Athlete	Age (years)	Weight(kgf)	Injury	Gender	Tigh lenght	Leg lenght
1	21	62	myelomeningocele	Male	40	38
2	16	51	myelomeningocele	Male	40	39
3	33	56	myelomeningocele	Male	38	36

The results of pressure distribution on the seat the athletes in the throwing frame (A) and adjustable anthropometric device (B) was demonstrating in Figure 2.

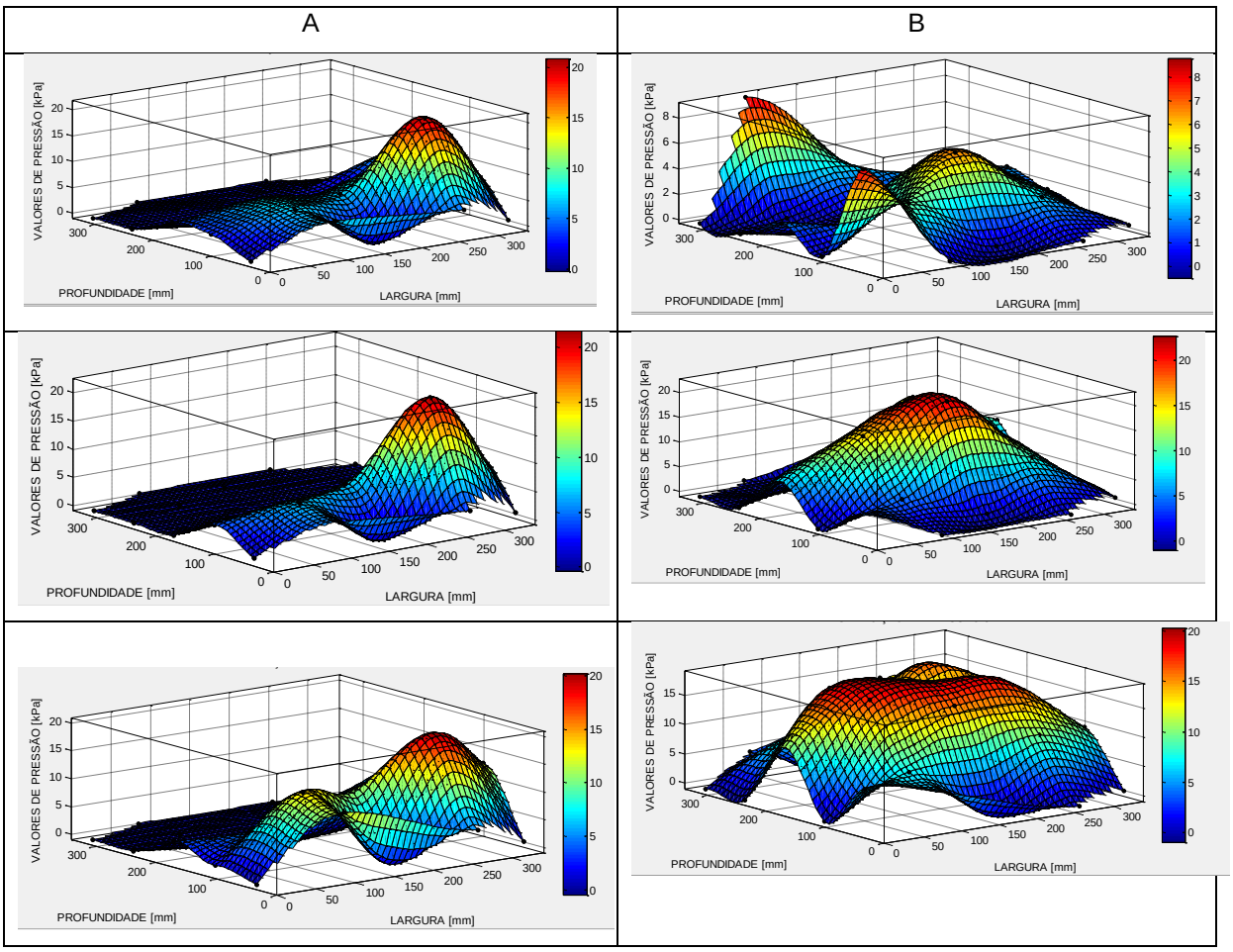

Figure 2- Pressure distribution for the athletes with (A) in the throwing frame and (B) adjustable anthropometric device

Many aspects may influence the distribution of forces in the support system and include the degree of spasticity, in the column changes as scoliosis, pelvic obliquity, cognitive functions, sensory information or his own muscle activity alters the distribution of pressure on the seat (TANIMOTO *et al.*, 2001).

The way to reduce the pressure on the seat is to make it to be distributed over a larger area, and that has been an important strategy in the devices of seat (SMITH, 2003). The study shows that the pressure distribution in adjustable anthropometric device presented a balance pressure distribution in the two ischial regions and thigh while in throwing frame focused in a small area of one of ischium.

4. CONCLUSION

It was observed in this work a balance pressure distribution in adjustable anthropometric device in the two ischial regions and thigh while in throwing frame focused in a small area of one of ischium. It was observed an increase not significant (p=0,134) in the pressure distribution on the seat the adjustable anthropometric device averaged 4,6 ± 0,16 Kpa compared with throwing frame seat with averaged 2,76 ± 0.15 Kpa. Assessment pressure distribution considering anthropometric aspects of seated throwers can be a parameter in order to help understand interaction between the throwing technique and design of throwing frame, prevent pressure sores, improving comfort the seated throwers.

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6. RESPONSIBILITY FOR INFORMATION

The author (s) is (are) the only ones responsible for the information included in this work.