ANALYSIS OF THE REACTION FORCES DURING CIRCLES EXECUTION ON A GYMNASTIC MUSHROOM.

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INTRODUCTION: Men's gymnastics is comprised of six events, all of them produce loadings to the upper extremity but specifically, the pommel horse demands repetitive and high intensity wrist impacts on a rigid structure, with sustained periods of body weight support on the wrist (Marklof et al, 1989). In a study of elite male gymnasts (Mandelbaun et al., 1989) the pommel horse was the apparatus associated with the most wrist pain. Most of the gymnasts begin at a young age to do this sport, therefore their wrist growth plate is a zone with critical injury options. The purpose of this study was to measure the force applied by the gymnasts during the execution of circles on a mushroom apparatus used to improve techniques of the pommel horse.

METHOD: Two experienced male gymnasts (international level) performed two series of ten circles on the mushroom. Gymnast number 1 is 17 years old, 56Kg and 1.61m tall.. The gymnast number 2 is 28 years old, 72 Kg , and 1.70 m. tall.
The mushroom was put over a force platform. Kistler Instrumente (model 9281B11) at a sample rate of 500hz (Digital filter Butterwortth, Low Pass, 10Hz).
Performance was recorded with three video analog cameras JAI corporation CV-S3300. Sample rate of the cameras was 50 Hz. Prior to the performance an event was captured at the same time with platform and cameras to synchronize the data collection.

RESULTS: Maximum peak resultant force was 1.82xBW. Every support on the mushroom began with a "saw tooth" in the graph of F /t . Gymnast number one performed symmetrical circles independently of the arm used and no significant differences were found comparing the applied force between both arms. The second gymnast has temporally asymmetric circles with significant differences on the mentioned forces,

DISCUSSION: Maximum peak of resultant force could be compared with impacts in pommel horse (higher than 1.5xBW), and to the force supported by the ankle running at 3 m/s - 4 m/s. (Marklof KL et al, 1990). High "saw tooth" values in vertical and lateral axis indicates a higher impact and an unstable support of the wrist. (Mandelbaun et al, 1989).

CONCLUSION: A kinetic profile for every gymnast exists and could help us know how force is applied during circles and how they change this kinetic profile to improve circle technique. Gymnast with the best competition level demonstrated during the circles better stability, smaller impacts, and good temporal symmetry.

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