A COMPARISON OF UPPER-EXTREMITY REACTION FORCES BETWEEN THE YURCHENKO VAULT AND FLOOR EXERCISE

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Translation: Does the second (or trail) arm experience the same amount of force in the round-off of a yurchenko compared to the round-off in back tumbling on floor?

WHAT THEY DID

Figure 1: The force plate was located directly under the sting mat, outlined in chalk.

The study consisted of 10 female gymnasts (8 collegiate & 2 club) performing three round-off, bhs-bhs on floor and three yurchenkos on vault each. Only the trail hand was placed on a force plate. Their coach was there to say whether the skill looked realistic.

WHAT THEY LOOKED AT

1. The peak vertical reaction force is a reaction force is a force that acts in the opposite direction to an action force.
2. The peak anterior-posterior reaction force is often referred to as a propulsion force and a braking force. A reaction force can be split into three dimensions. Here they are just looking at the forces that line up with the Vault runway.

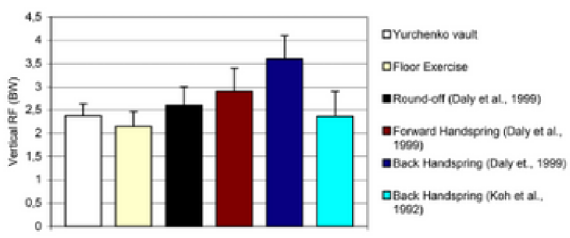

Figure 2: This study's results compared to others looking at different skills. In this study, the trail arm on floor experienced 2.15x a gymnnast's body weight, while on vault the arm experienced 2.38x.

WHAT DID THEY FIND

1. "Peak vertical reaction force values during the round-off phase of the yurchenko vault were 11% greater than during the floor exercise round-off."
2. The average "peak anterior-posterior reaction forces during the round-off phase of the yurchenko vault were 30% greater than during the floor exercise round-off. Peak posterior reaction forces were greater than anterior reaction forces for each participant."
3. They found that the trail arm in a round-off into a yurchenko on vault produces similar vertical reactions forces that of someone's foot running 5 m/s.

AUTHORS' COMMENTS

The higher force on the second arm on vault might be because of the longer run leading up to the vault than the run on floor. The best way to determine if this is the cause would be to look at the speed that each gymnast is traveling at when they hurdle into their round-off.

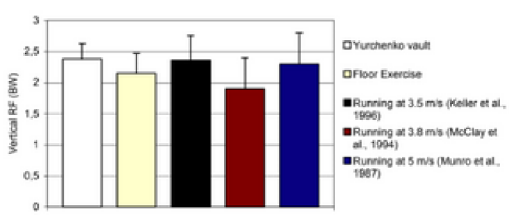

Figure 3: This study's results compared to running at different speeds. They found that the trail arm in a round-off into a yurchenko on vault produces similar vertical reactions forces that of someone's foot running 5 m/s.

GRI Takeaways:

While this is a small sample size, the biggest thing to note here is that the trail arm is experiencing over 2x that gymnast's body weight during a round-off. That is a lot of force on a limb that normally does not do a lot of weight bearing activities. This is a reminder of the importance of "drilling the skill" and slowly building up the force over time.

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SOURCE

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