MOVEMENT BIOMECHANICS AND LATERALISATION IN DART THROWING

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1 INTRODUCTION

Darts is a sport that has no age or gender and requires skill to score as many points as possible. In this study an archery target paper with bright colours and consisting of 10 scoring zones in gold, red, blue, black and white rings was used. The innermost yellow rings score 10 and nine points, red rings score eight and seven, blue rings score six and five, black rings four and three, while the outermost white rings score two and one points.

Although both arms are supplied in the same way, the dominant upper limb compared to the non-dominant one always presented superior performance characteristics. An example is in the case of the elbow, which when comparing the dominant limb with the non-dominant limb, always present greater flexion-extension, pronation-supination movement, this being a consequence of the dominance of the dominant limb for most day-to-day activities. It was found that the maximum voluntary contraction (MVC) of the first dorsal interosseous muscle (FDI), grip strength and pinch strength are some of the characteristics in which the dominant arm stands out, with an increase of 3%, on average across all characteristics. This refutes the idea of Crosby and Wehbé [1] who argued that the difference between the dominant hand and the non-dominant hand would have around 10% difference in these same characteristics. One of the factors that can influence this difference may correspond to muscular development, as whenever possible, humans use their dominant hand to perform any task that requires the upper part of the axial skeleton. A study demonstrated that even if a person has an injured dominant hand, they will avoid using their non-dominant hand even if it has greater dexterity than their dominant hand [2].

As for throwing in the dart game, it is predictable that the dominant arm will always have an advantage due to the factors mentioned above, however, it is a sport that can be trained to the point that the non-dominant arm can get almost completely closer, continuing the dominant arm having the advantage. However, this does not mean that if someone tries to practice initially with their non-dominant hand, they will guarantee an advantage over someone who practices in the opposite way, because as in basketball, someone who initially practices with their non-dominant hand shooting for the basket will have a greater advantage over someone who started with the dominant hand. This may be due to brain lateralization [3].

A study showed that people with a dominant left hand tend to have a greater similarity in dexterity between their dominant and non-dominant hands, while those who have their right hand as their dominant hand always have superiority in their dominant hand compared to their non-dominant hand. Therefore, it is expected that, in terms of throwing in the dart game, there will be an advantage for a person with the left dominant hand, over a person with the right dominant hand.

2 METHODOLOGY

There are several types of games in the darts game and each one has its specific rule, but here we will consider that the objective is to score as many points as possible per throw. Each player is normally entitled to 3 shots per trial.

In this study we have a sample of 12 female and male participants, aged between 20 and 25 years old, with one male and one female participant being left-handed and the rest being right-handed. For each person, 18 throws will be obtained for each arm, dominant and non-dominant. All these launches will be divided into distinct trials where each trial will have 6 launches, thus totalling 3 trials per member. To establish a baseline measure, it was recorded an initial two-minute rest period before beginning the first movement.

The dataset obtained using the motion capture system XSENS MVN Awinda system that uses inertial sensors and was enriched with the input of strategically positioned sensors, carefully placed on the hand, forearm, upper arm and shoulder both right and left. The Mt Manager program allowed the extraction of values such as angular variation, acceleration and angular velocity. The XSENS system, integrated with the MT Manager software, enabled the gathering of precise and synchronized data, ensuring accuracy in the analysis.

3 RESULTS

Overall participants scored higher, and the overall duration of the launch was smaller while using the dominant hand. Regarding the results in the shoulder were recorded small variations as expected with the upper arm, forearm and hand recording the highest variations among the participants. Rotation and flexion-extension movements recorded higher values during the dart throwing activity. While inversion eversion recording higher values only in the segment of the hand, radial and ulnar deviation, both dominant and non-dominant. The female left-handed participant showed a higher similarity in dexterity with both the left and the right limb.

4 DISCUSSION/CONCLUSION

The results unequivocally indicate that the dominant limb performs better at dart throwing.

However, it is crucial to recognize the limitations inherent to the study, which include a relatively reduced sample size. To further boost the research in this area, future surveys should include larger groups of participants and diversity in laterality including also ambidextrous participants sorted using a laterality questionnaire. The incorporation of electroencephalography data, also recorded with sensor technology, introduces a promising avenue for probing the cognitive and neural processes underlying upper limb movements with playing darts, promising to improve the understanding of this sport form.

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