ASSESSMENT OF FOUR DIFFERENT BACK HANDSPRINGS

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INTRODUCTION

In tumbling the back handspring is most often used as a transitional skill in combination with a lead in skill such as a round-off into a backward directed skill such as a backward somersault. The back handspring is first introduced to gymnast at a young age and is a skill that is very frequently executed in training and competition through out a gymnast’s career. Koh et. al. (1992) and Hall (1982) have suggested that the repetitive loading about the upper extremities and the extreme range of motions seen in the lumbar spine in back handspring may put the gymnast at risk of overuse injuries. They also suggest that this risk can be increase due to poor execution often observed during the early phases of learning. Gymnastics Canada maintains that a major role of coaching tumbling is the use of training ‘gimmicks’ which permit the safe learning of tumbling skills especially during the critical early stages of development (Kinsman, et. al., 1986). It was the purpose of this study to examine four different back handsprings used for teaching and training the back handspring in artistic gymnastics.

METHODS

Four young male gymnasts (10, 11, 12@12yrs) were recruited. The subjects’ mass were 41kg, 39.8kg, 29.4kg and 36kg. Parental consent was acquired for the study. The boys were all familiar with all 4 variations of the back handspring. The gymnasts were fitted with reflective markers over the joint centers on the side of the body closest to the cameras. Data was collected using standard 2D video techniques using two JVC GR-DVL9800 cameras operating at 120Hz. The cameras were positioned to the side of the subject 2. The incline with the feet landing on the tumbling mat over the force plate. For the last condition, the accelerated back handspring, the round-off was initiated on the incline with the feet landing on the tumbling mat proceeding into the back handspring. The boys’ coach assisted in the spotted standing back handspring. In addition to measuring ground reaction forces at the hands, the shoulder and hip joint angles were monitored. The angle of incidence defined, as the angle formed between the center of mass, the wrists and a negative horizontal at hand contact was also measured. A one-way ANOVA with repeated measured was used for statistical analysis. The p-level was set .05. A LSD post-hoc test was used where warranted.

RESULTS AND DISCUSSION

The subjects performed multiple trials of each condition to assure a representative sample of their back handsprings and appropriate targeting of the force plate. A typical vertical ground reaction force time history for subject 2’s execution of the 4 back handsprings is displayed in Figure 1. Peak vertical forces were found to be significantly lower in the spotted standing back handsprings than in the other three back handspring conditions (p<0.01). There were no significant differences in vertical forces between the other three back handspring conditions. These relationships are illustrated in Figure 2. The mean for the 4 gymnasts under the four conditions for vertical force was 3.57BW (SD=0.80BW). Although approaching only conventional levels of significance, the 2 back handsprings utilizing the inclined mat and the round-off back handsprings produced greater linear momentum in the direction of progression than the assisted back handsprings. Contact time on the hands was found to be significantly higher for the standing back handsprings (1 & 2) when compared to conditions 3 and 4, which included a round-off.

Figure 1: Vertical ground reaction forces on the hands for subject 2.

Kinematic descriptors related to body position at foot and hand contact did not appear to be significantly different across conditions however, based on the angle of incidence
at hand contact, the inclined back handspring had gymnasts landing in a more vertical position.

Figure 2: Peak vertical ground reaction forces on the hands.

SUMMARY

The back handspring performed down the inclined mat appears to provide the learner with better transition qualities than the spotted back handspring. This did not appear evident between the round-off back handspring and the accelerated back handspring. There is little evidence to suggest that any one of these back handsprings put the young gymnast at a greater risk than another.

REFERENCES


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