Hand Position in a Back Handspring (Flic-Flac)

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Introduction

Gymnasts often learn a back handspring relatively early in their career, and the skill is an enormous feather in their cap. Unfortunately, athletes often learn a back handspring from friends, on the lawn or with instructions that are less than optimal. One of the more important aspects of safe performance in the back handspring is placement of the hands during the hand contact phase. Should the fingers of the hands, and thus hand orientation, be pointing directly forward, outward (to the side), or inward (toward each other)? In judging the best position for the hands, we would like to discuss mechanical and anatomical factors before describing what we believe to be the optimal hand position.

When the gymnast lands on his/her hands in a back handspring, considerable force is placed on the hands. Koh, Grabiner and Weiker (3) showed that ground reaction forces on the hands during a back handspring averaged approximately 2.3 times body weight and that valgus forces (forces directed laterally or toward the rear resulting in bending the elbows) reached 0.03 times body weight. Forces seen at the hand and floor interface transfer to the wrist, elbow, and shoulder. However, the values of these forces are not easily determined. Forces of 2.3 times body weight, as seen in the back handspring, are higher than those seen in the lower extremity during aerobic dance (0.98 times body weight "low impact" and 1.98 times body weight "high impact") (5).

Mechanical Factors

The purpose of a back handspring is to increase horizontal momentum of the body in the overall tumbling pass and to convert some of the horizontal momentum to vertical during the take-off from the feet. This final action of redirecting momentum can be made considerably easier by an effective push from the hands. Bosco (1), in reviewing a thesis on the biomechanics of the round-off, back handspring, and somersault by Holmes, wrote that expert gymnasts exceeded lesser gymnasts in all of these aspects. A study by Yuen (7) of three hand positions in the back handspring showed that when the hands were turned in to roughly a 45 degree position, the resulting vertical displacement of the center of mass following take-off from the feet was significantly higher than when the hands were placed with fingers forward or fingers outward. Interestingly Sands (6) indicated that gymnasts should use the position found to be most effective by Yuen in a 1984 coaching book. However, this judgment was based on coaching experience rather than data.

Anatomical Factors

Carrying angle. Women and men, on average, have natural anatomical differences in their elbow structure. The elbow structural difference has been noted in an "old wives' tale." The angle of the elbow is called a "carrying angle" because it was thought that women were better designed to carry buckets from a well with this anatomical "difference." The old tale indicated that the laterally oriented forearm (i.e., more to the side) of the female would result in less chance of the bucket hitting the leg during carrying. Figures 1 and 2 show the elbow structure of a female and male.

Figure 1.

Dr. McNeal's elbow structure. Note that her elbows almost touch (i.e., the "carrying angle." Female athletes often show a more pronounced carrying angle and may easily touch their elbows and the length of their forearms.

Figure 2.

As a male representative, the photograph shows my elbows and forearms. Note that, on average, the male's arms have less of a carrying angle the female's arms.

While there can be considerable variation in the magnitude of carrying angles among individuals, the result of the carrying angle is that females, again on average, are at a greater risk of elbow injury because of their elbow structure than males. This problem often becomes apparent when a gymnast falls on an outstretched arm (usually while falling backward).

Potential for Injury Prevention. By turning the hands "in," the gymnasts, particularly females, can reduce the problem of injuring an elbow (due to the carrying angle) and reduce the risk of damage to the wrist (by reducing wrist hyperextension). Hyperextension of the wrist has been linked to an increased likelihood of wrist injury (2;4). The basic idea is that by turning the fingers in (slightly), the gymnast's elbows are simply more likely to bend. This may seem counterproductive, but the elbow bend does not have to be pronounced. The major point is that the elbows can bend if the gymnast lands "short" or underrotated. In order to visualize the contrast, Figures 3 and 4 show a "short" impact on a gymnast with two hand positions, fingers forward and fingers turned inward.

Figure 3.

Note that in this position, as the gymnast's elbows bend, the forearm moves closer to the floor, and the wrist moves away from hyperextension toward a straighter wrist-forearm position. This takes pressure off of the extreme hyperextension position of the wrist often encountered by gymnasts when learning the back handspring.

Figure 4.
In this position, with fingers forward, the bend of the elbows on hand contact does not reduce hyperextension of the wrist. In fact, hyperextension of the wrist may be encouraged by this position.

The anatomical implications of the hand position in the back handspring show that turning the hands "in" slightly results in reduction of impact forces on the elbow due to more easily allowing the elbows to bend. Moreover, by turning the hands in slightly, the ability to bend the elbows on a short landing helps protect the wrist by moving the wrist away from extreme hyperextension. This is accomplished when the forearms move closer to the floor by permitting elbows to bend on hand impact.

Conclusion

Both mechanical and anatomical information support the idea that the best position for the hands during a back handspring is slightly turned in. Research into the mechanical aspects of hand position in the back handspring have shown that turning the hands in results in a higher center of mass on take-off from the feet when compared to a fingers forward or fingers sideward position. This translates to a better "snap-down" and a more effective rise of the torso during the take-off. Anatomical considerations, although perhaps harder to visualize, show that by turning the hands in, the elbows are more likely to bend during a "short" landing on the hands. The elbow bend takes the forearms away from the hyperextension position of the wrists and thus helps protect the wrists from extreme hyperextension.

Reference List

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