Displacement Characteristics in the Long Jump
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When we examine many of the fine points of the approach, setup, and takeoff, the long jump appears to be a rather complex event. As coaches, we must consider how the penultimate step is set up, how the foot contacts the ground, lowering issues, how the takeoff leg sets up, the takeoff leg's contact and firing characteristics, and postural alignments throughout. All jump coaches have had athletes that needed to be "fixed " in one or more of these areas, and fortunately, we normally get to work with some who are already proficient in at least a few.

At the same time, while spending endless hours trying to perfect these intricacies, we sometimes tend to lose sight of the big picture. An athlete's displacement characteristics often have more to do with the success of the jump than any of the aforementioned intricacies. We tend to get so caught up in "how" that we forget to examine "where".

The jump should be examined and considered as a modification of the running mechanics exhibited in the final steps. The jump is not an entity to itself, the context of running mechanics offers meaning and purpose to what we are trying to accomplish in the jump. To form an analogy, to examine a jump outside of the context of the run is like examining a punch line outside the context of the joke.

Any efficient sprinter exhibits some vertical displacement while pushing off from each step. This results in a path of the body's center of mass that when examined from the side, exhibits a certain bounciness, a sinusoidal wave pattern. This sinusoidal wave pattern (when performed within reason, not excessively) is synonymous with efficient running for two reasons. First, elastic energy generation in the run increases, as stretch reflexes are elicited in the extensor muscles of the leg during support. Secondly, stride length is effectively increased due to higher pushoff angles and the resulting longer flight phases.

When we examine the characteristics of this sinusoidal wave, we see that the low points are found at mid support, while the high points are found in mid flight. Preparation and takeoff in the long jump are simply a modification of the amplitude of this wave. The support phase of the penultimate step offers an opportunity for an exaggerated, extended low point, while a subsequent exaggerated high point follows in succession (the jump itself).

Therefore, the jump is simply and exaggerated low point/high point combination. Thus, maintaining the amplitude and period of this wave during the last few steps of the run is crucial. If the amplitude of the wave (the height of the highs and lows) decreases as the board is approached, then it becomes much more difficult to magnify the amplitude of the wave into a jump takeoff. If the period of the wave decreases (the distance between high points) decreases, then it becomes very difficult to spread them out again in order to jump far. This is why stride length should be conserved in the final few steps of the run. Within reason, long steps give you a chance to have a long jump.

In an effective long jump, the locations of the high points should continue be in flight, and low points should continue to be in support. Therefore, it seems obvious that to blend run into jump effectively, the lowering associated with the penultimate step should occur during the support phase of that step. Often we see techniques that exhibit lowering during the flight phase prior to the penultimate step. This technique is inconsistent with the wavelike path of the body's center of mass established previously, harming takeoff efficiency.

Another consideration is the location of the lowering. If the lowest point of the center of mass is reached before the board, then the subsequent rise of the center of mass will occur prematurely also. If this rise occurs before the jumper reaches the takeoff board, the distance achieved before the board is wasted, it does not contribute to the performance. Just because the foot is on the board does not mean that the jumper is jumping from it. Often in faulty jumps, the body begins to rise before the board is reached.

The most effective takeoffs show lowering initiated during the support of the penultimate step, the lowest point achieved over the board, and the rise associated with the takeoff occurring in front of the board. Keep this in mind, because helping your jumpers to understand these landmarks fosters greater understanding of what we are trying to accomplish in the bigger sense.