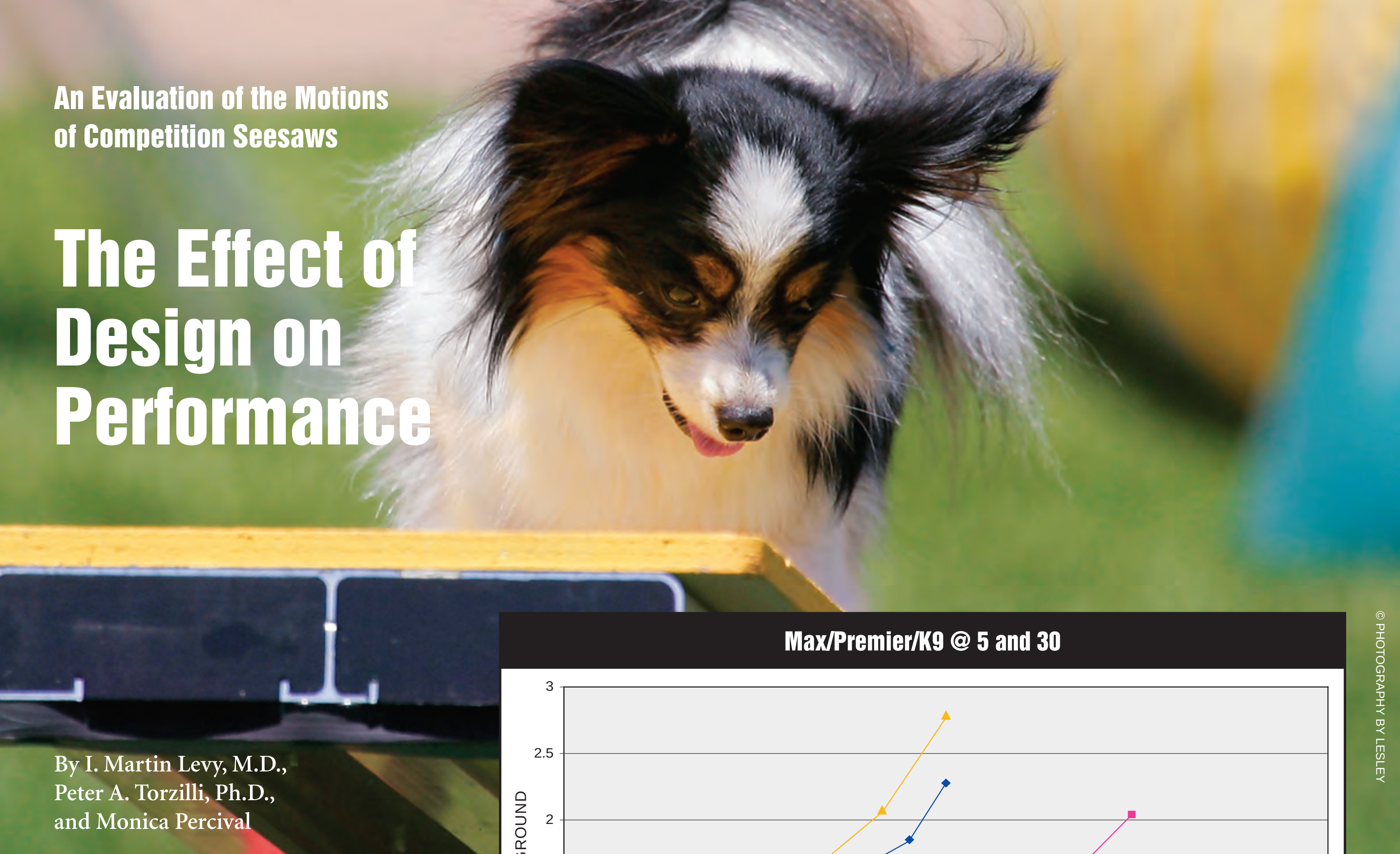
An Evaluation of the Motions of Competition Seesaws

# The Effect of Design on Performance



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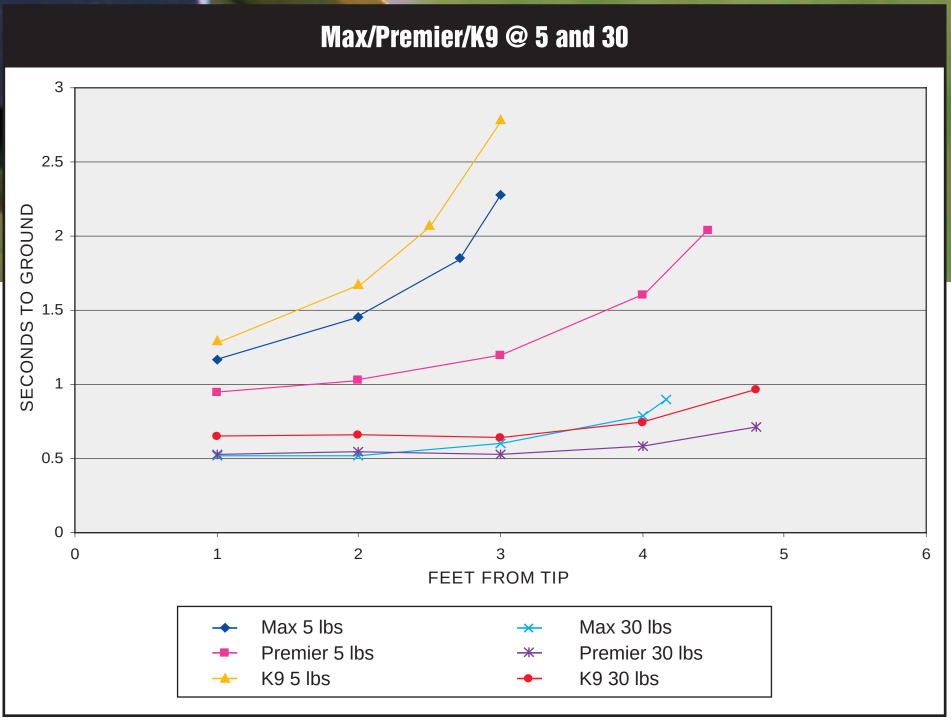
The seesaw is unlike any other obstacle on a dog agility course because the performance *on* the obstacle depends on the performance *of* the obstacle. Variations in plank, fulcrum, and base construction directly influence the motion characteristics of each seesaw design. In an effort to insure consistency of performance, the various organizations for dog agility have been quite specific about plank dimensions and pivot height. They have been less precise when defining a seesaw's response to varying conditions of load. Because of this, various seesaw solutions have been designed and constructed, each with its own set of performance characteristics. The rate of descent, support-base movement, plank vibration, and noise are all influenced by the design solution and the materials chosen to execute that design.

In an effort to understand the effect of design variations on seesaw performance, we evaluated three distinct designs. The purpose was to determine how each design reacted to an applied load. In addition, we wanted to understand how varying the load and the point of load application affected the response of the seesaw. Finally, we wanted to determine how each seesaw responded to the abrupt cessation of plank rotation.




Note: The information included in this article is a brief summary of our findings. For a free copy of the complete research report, please go to www.cleanrun.com/surveys.cfm.

## Materials and Methods

Max 200 (Port Byron, New York), Action K-9 Sports Equipment (Sun City, California), and Premier Agility Equipment (Surrey, England) seesaws, all of which are used regularly in competition, were evaluated. They were selected because each had distinct design elements.

We performed three sets of tests. In the first test, we placed sandbags of known weights (5, 10, 20, 30, and 50 pounds) on the descending arm of the seesaw, at known distances from the end of that arm. Initially, we held the descending arm, with a sandbag in place, in the starting position. We then released it and measured the time from starting position to impact with the floor to the hundredth of a second. We performed a second set of tests to determine the stiffness of the boards. In the third set of tests, we evaluated the amount of ascending-arm-induced bending ("board whip") by tracing the travel of that arm during normal seesaw motion.

## Results

We plotted the results of the drop tests for a known load for each seesaw as "distance from tip" versus "time." We compared the drop tests at 5 and 30 pounds for the three seesaws and illustrated them on a single plot shown in the graph.

We determined the stiffness of each board: The Premier board had the greatest stiffness and the Action K-9 board the least. The Max 200 board was only slightly stiffer than the Action K-9 board.

We measured board whip at 30 pounds for all three boards. The averaged Action K-9 board-whip value was 14 cm., the averaged Max 200 board-whip value was 10.4 cm., and for the Premier board, 9.3 cm.

## Discussion

Fulcrum design influences the speed at which the board descends. For two designs it is evident that smaller loads take longer to fully displace the descending arm. For the fulcrums with square on round tube or round on round tube assemblies (Action K-9 and Max 200, respectively), as the leverage decreases (the distance of the load from the end increases), the descending arm slows even more. When we applied light loads at increasing distances from the end, the descent of the board slowed considerably. In contrast, the low-resistance blade/plate fulcrum (Premier) had less effect on the rate of descent of the board for both light and heavy loads, applied at varying distances from the board end.

Board whip appeared to be a function of the stiffness of the board. In this study, the more flexible boards (Action K-9, Max 200) were associated with greater amounts of board whip, resulting in *catapulting* of their loads—the sandbag bounced off the end of the board. All three boards still had to dissipate the energy developed in the ascending arm. This energy was transferred to the base, which resulted in two of the seesaws "hopping." In the case of the Premier seesaw, however, the linkage in the base dissipated the upward force, and whipping, catapulting, and hopping were minimal.

## Recommendations

- It is important that agility's governing organizations establish a more precise set of specifications for the seesaw to include the stiffness of the board and the response of the obstacle to a variety of load conditions. These parameters will allow a dog to anticipate a predictable performance from the obstacle. A single maximum time limit for a single load does not adequately characterize the performance of a seesaw obstacle.
- To insure that a seesaw obstacle's performance is similar for both small and large dogs, we recommend using blade/plate fulcrums. Their use will avoid the frictional effects of the tube-on-tube assemblies and the variations in response to different loads that are a by-product.
- Although stiffer boards exhibit less board whip (and catapulting), launching or hopping of the base remains a problem. Incorporating force attenuators into the base can eliminate launching.

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