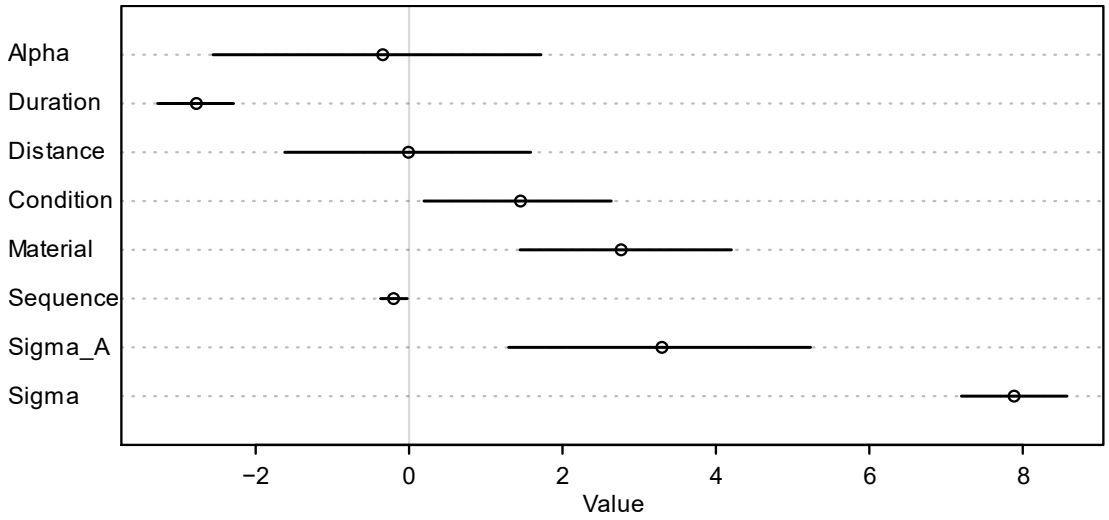


Fig. S1.

A multilevel Bayesian modeling approach was used to assess the extent to which duration, target material, and target mounting explain post-impact kinetic energy. In tests with live trap-jaw ants as the energy source, Bayesian modeling established that post-impact kinetic energy increases with decreasing contact duration, changing the target condition from free to fixed, and changing the target material from compliant to stiff. In this visualization of the model outputs, open circles represent the estimated values for each of the parameters and horizontal lines represent the uncertainty for each value (with percentile interval boundaries at the 5.5% and 94.5% quantiles). The tested parameters appear along the y-axis and include Gaussian parameters (Alpha, Sigma_A, and Sigma) and predictors (Duration, Distance, Condition, Material, Sequence). Alpha represents the model's estimated post-impact kinetic energy when the predictors are all set to 0. Duration represents the contact duration, Distance represents the distance between the ant and target, Condition represents the change from a freely swinging target to a fixed target, Material represents the change from the compliant material to the stiff material, and Sequence represents how many strikes the ant performed previously. For all of these predictors, the x-axis value represents the expected change in post-impact kinetic energy given an incremental change in the predictor of interest while all other predictors are set to 0. For example, uncertainty lines that cross zero (such as those for Distance) indicate that this predictor could either increase (positive values) or decrease (negative values) post-impact kinetic energy. Note that changing the condition from free to fixed increases post-impact kinetic energy, but not as much as changing the material from compliant to stiff. Finally, Sigma represents the standard deviation of the mean post-impact kinetic energy while Sigma_A represents the standard deviation of the post-impact kinetic energy among the sampled ants.

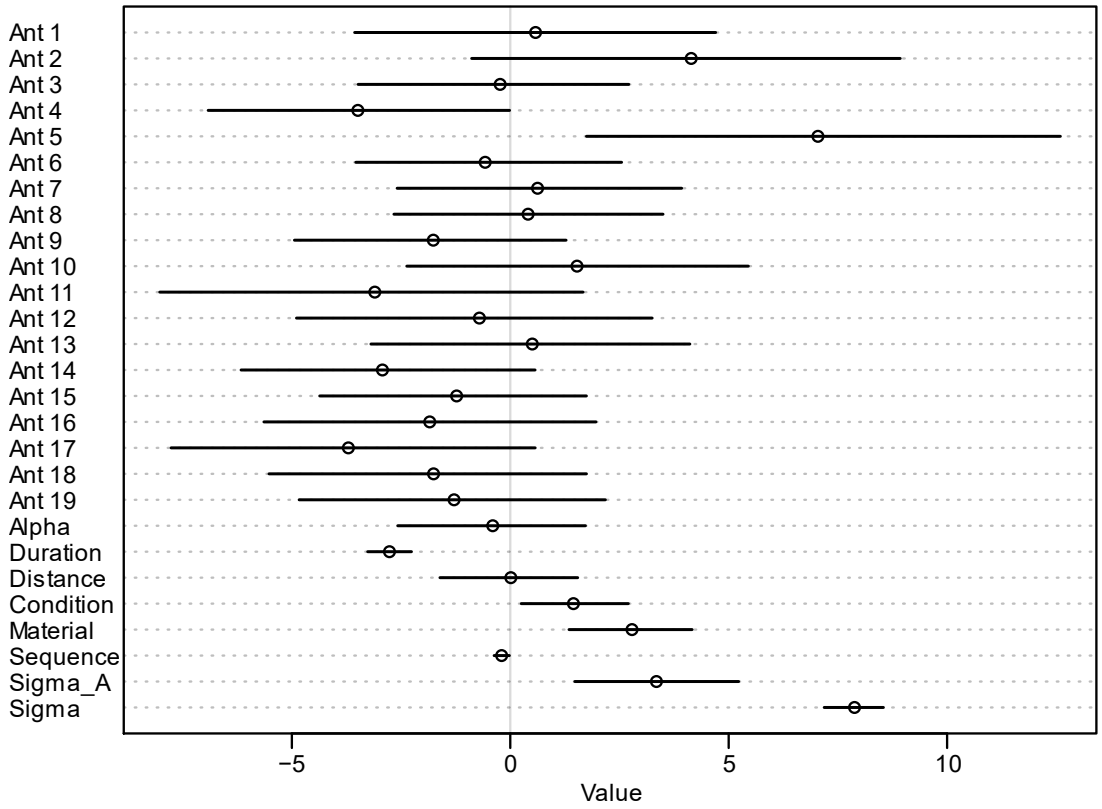


Fig. S2.

By visualizing the estimated intercepts for each individual ant, we found that the individual identity of the ant performing the strike had a minimal effect on post-impact kinetic energy. Our data consisted of 212 strikes from 19 ants with a varying number of strikes performed by each ant. By assigning an intercept to each group of strikes performed by the same ant, the model accounts for differences between groups of strikes performed by one ant versus those performed by another ant. These intercepts are represented by the open circles for Ants 1 to 19. The horizontal line overlaying each open circle represents the uncertainty for each assigned intercept (with percentile interval boundaries at the 5.5% and 94.5% quantiles). For many of the ants, intercept values were close to 0 with uncertainty bars that crossed zero. This indicates that the individual identity of the ant that performed the strike did not have a large effect on post-impact kinetic energy. Note that Ant 5's intercept value is positive and does not cross the zero mark; therefore, strikes from this ant had greater post-impact kinetic energy than did the other ants in this study.

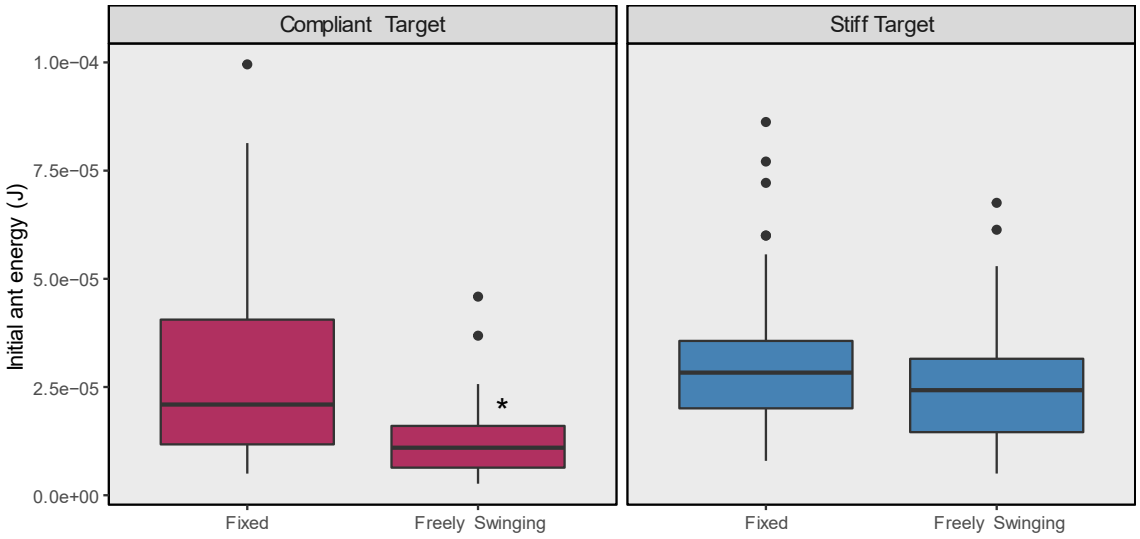
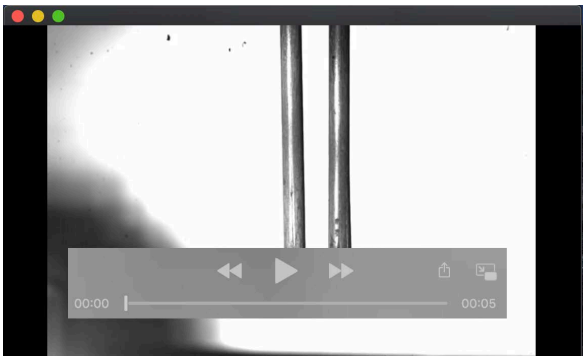


Fig. S3. Using the kinetic energy ratios from the impactor tests as the coefficient of restitution, we found that the initial energy delivered by the ants was consistent across all target types except for the freely-swinging compliant targets (statistical results are presented in Supplementary Table 1).

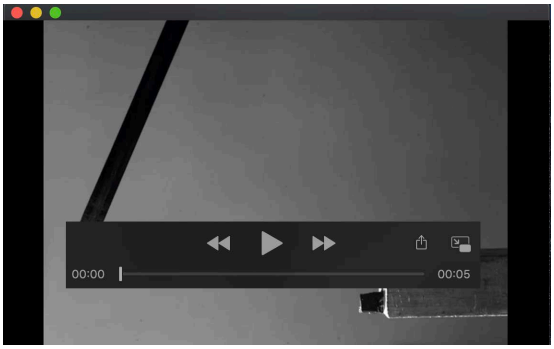
Data compared: (target 1 – target 2)	**Median µJ:** (target 1, target 2)	**Sample size (# strikes):** (target 1, target 2)	**W-value**	**P-value**
Fixed compliant – free compliant	2.09×10^{-5}, 1.09×10^{-5}	50,55	2137	1.03e-6 ***
Fixed compliant – fixed stiff	2.09×10^{-5}, 2.83×10^{-5}	50, 52	1100	0.1817
Fixed compliant – free stiff	2.09×10^{-5}, 2.42×10^{-5}	50, 55	1396	0.8954
Free compliant – fixed stiff	1.09×10^{-5}, 2.83×10^{-5}	55, 52	348	1.572e-11 ***
Free compliant – free stiff	1.09×10^{-5}, 2.42×10^{-5}	55, 55	579	2.438e-8 ***
Fixed stiff – free stiff	2.83×10^{-5}, 2.42×10^{-5}	52, 55	1685	0.1127

Table S1. Initial ant energy from impacts against a freely-swinging compliant target was significantly different from other target types. This table presents the results from the Mann Whitney U tests. Asterisks indicate a P-value << 0.001.



Movie 1: Trap-jaw ant strike vs freely-swinging, compliant target

A suspended trap-jaw ant striking a freely-swinging, compliant target filmed at 3000 fps.



Movie 2: Validation impactor vs fixed, compliant target

Our validation impactor striking a fixed, compliant target filmed at 3000 fps.

Movie 3: Trap-jaw ant strike vs fixed, stiff target – Ventral view

Ventral view of a suspended trap-jaw ant striking a fixed, stiff target filmed at 210,000 fps.