SUPPLEMENTARY FIGURES

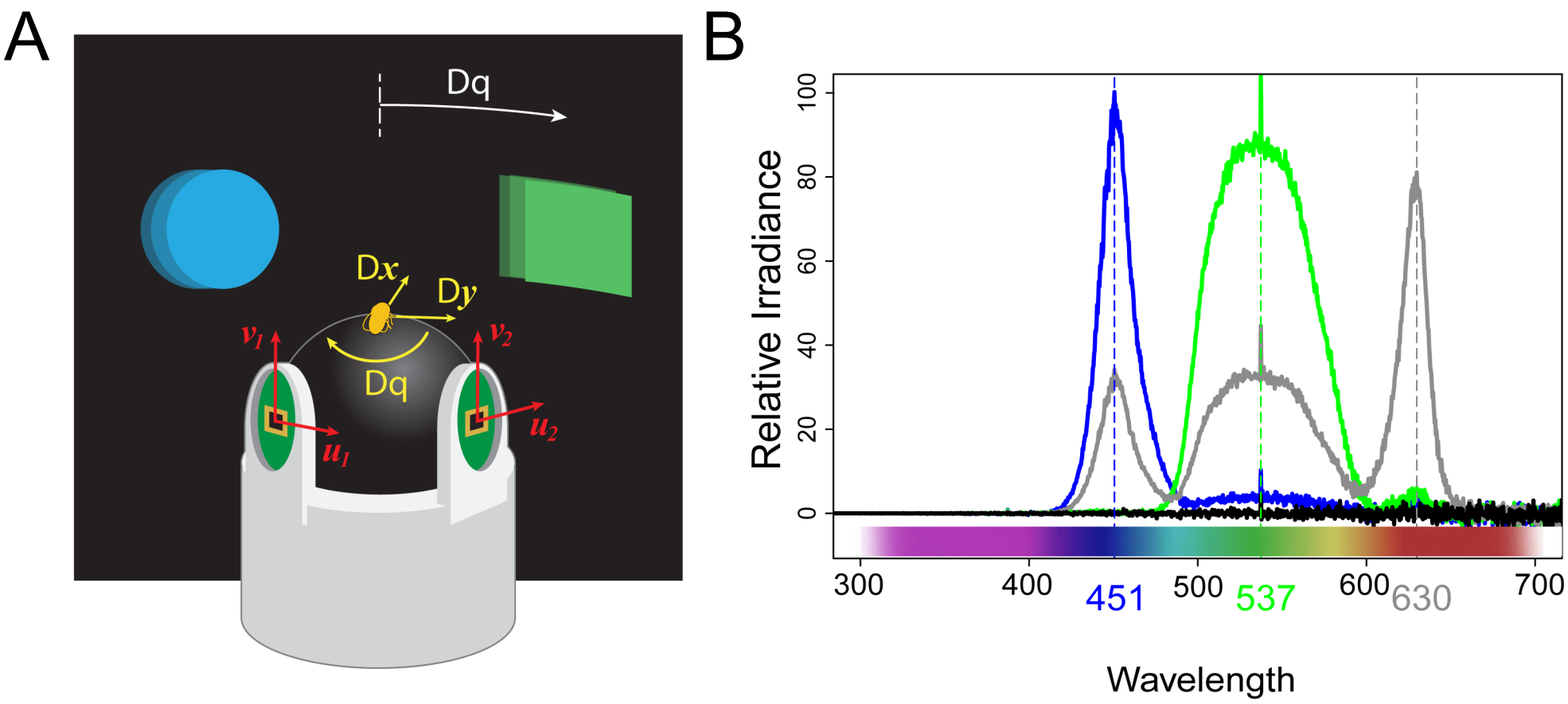

Fig. S1. Arena and visual stimuli. (**A**) Recording of bee motion and translation to stimuli. Rotation of the ball is recorded by optic laser sensors and optical motion measurements (u_i, v_i) are used to calculate the lateral translation (Δx, Δy) and yaw rotation (Δq) of the walking bee. Closed-loop control of the stimuli are based on this last measurement. (**B**) Relative irradiance of visual stimuli. Blue stimuli present a peak at 451 nm and green stimuli at 537 nm. The gray bars pattern presents peaks in the blue, green and red spectrum with similar intensity in the blue and green and a higher peak in the red spectrum (λ=630 nm).

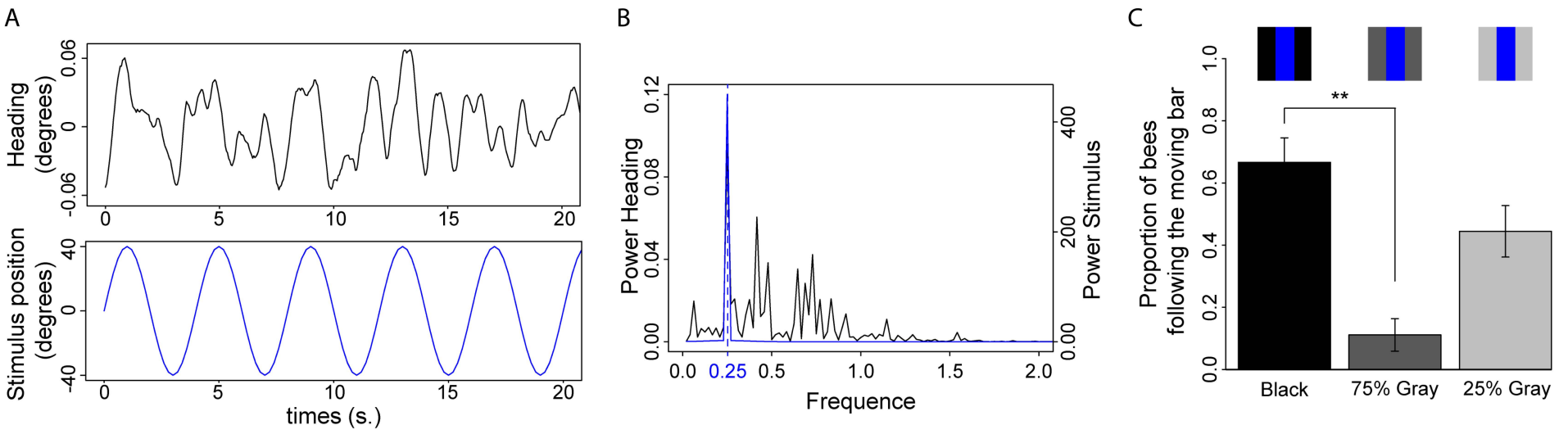

Fig. S2. Response to a moving projected stimulus. A blue bar moving as a sinusoid of 0.25 Hz was projected during 45 sec. **(A)** Example of the instantaneous heading (top) and stimulus position (bottom) during the experiment. **(B) Associated periodogram for the visual stimuli (blue) and the bee's heading (black). (C)** Percentage of bees following the stimulus for the three different backgrounds (black, level of grey 75% and 25%). Bees were more prone to follow the stimulus were projected on a black background (Friedman post-hoc test, $p < 0.01$, sample size: 9).

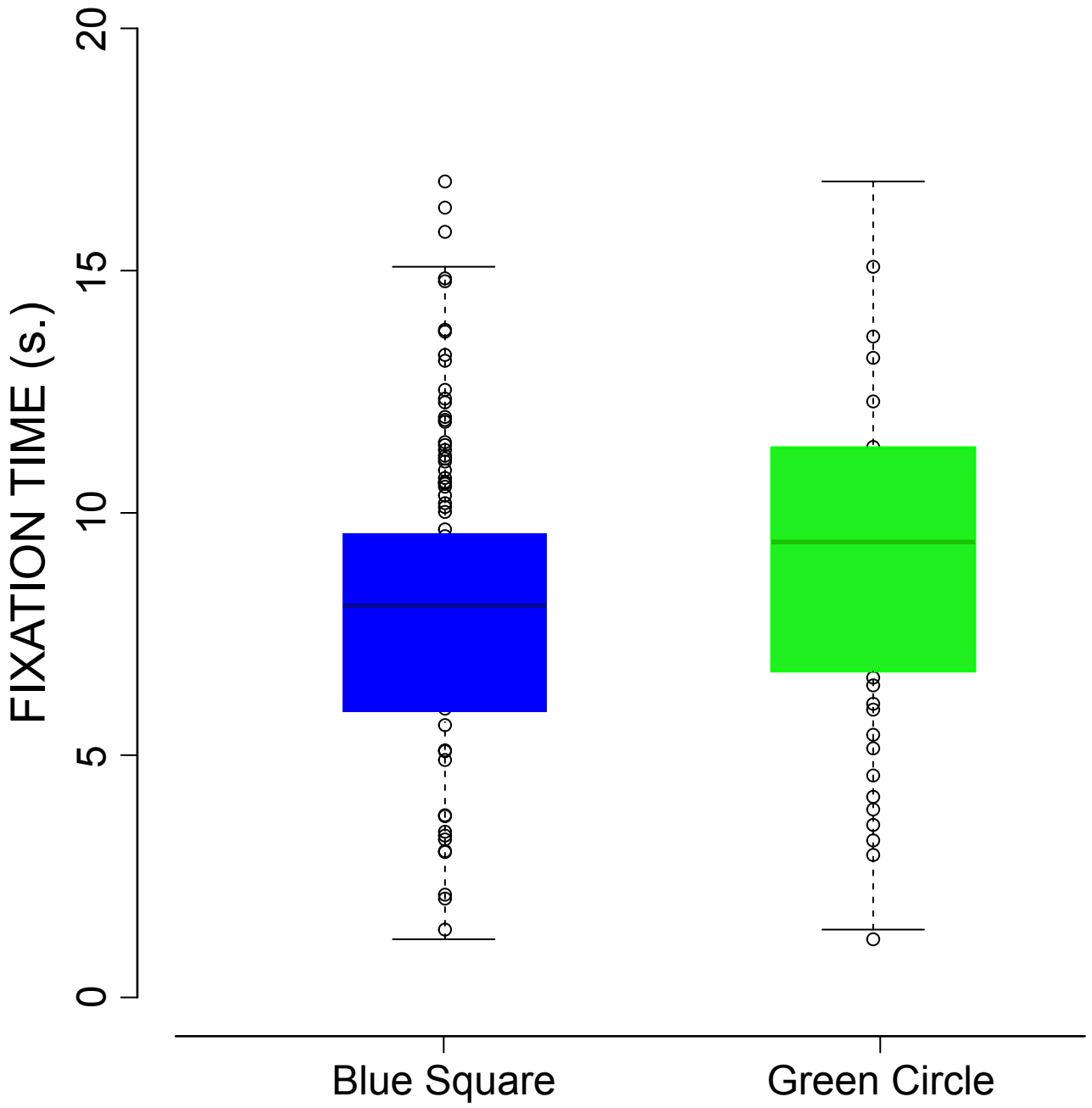

Fig. S3. Time spent fixating the stimuli during pre-test according to the innate preference for the naive, unpaired and trained bees. Bees spend similar amount of time fixating stimuli regardless of their innate preference (t-test, p=0.1095, sample size = 34, 70).

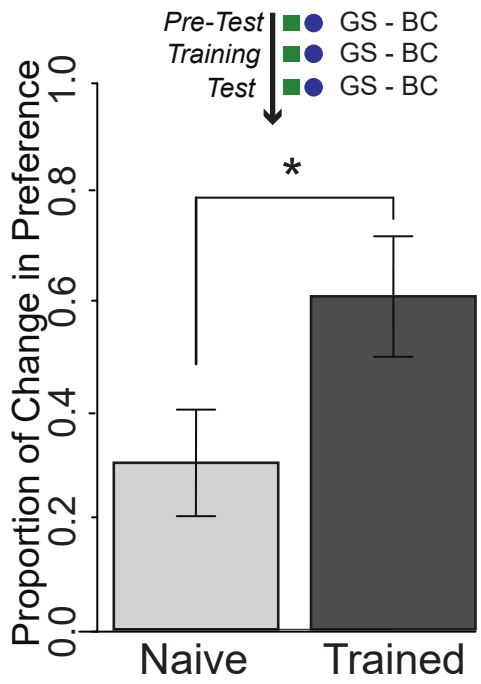

Fig. S4. Learned response of honeybees exposed to a green square and a blue circle. Proportion of bees that changed their stimulus preference between the pre-test and test phases for naïve and trained bees. Asterisks denote $p<0.05$ (*z*-score); sample sizes were 30 and 20 respectively.

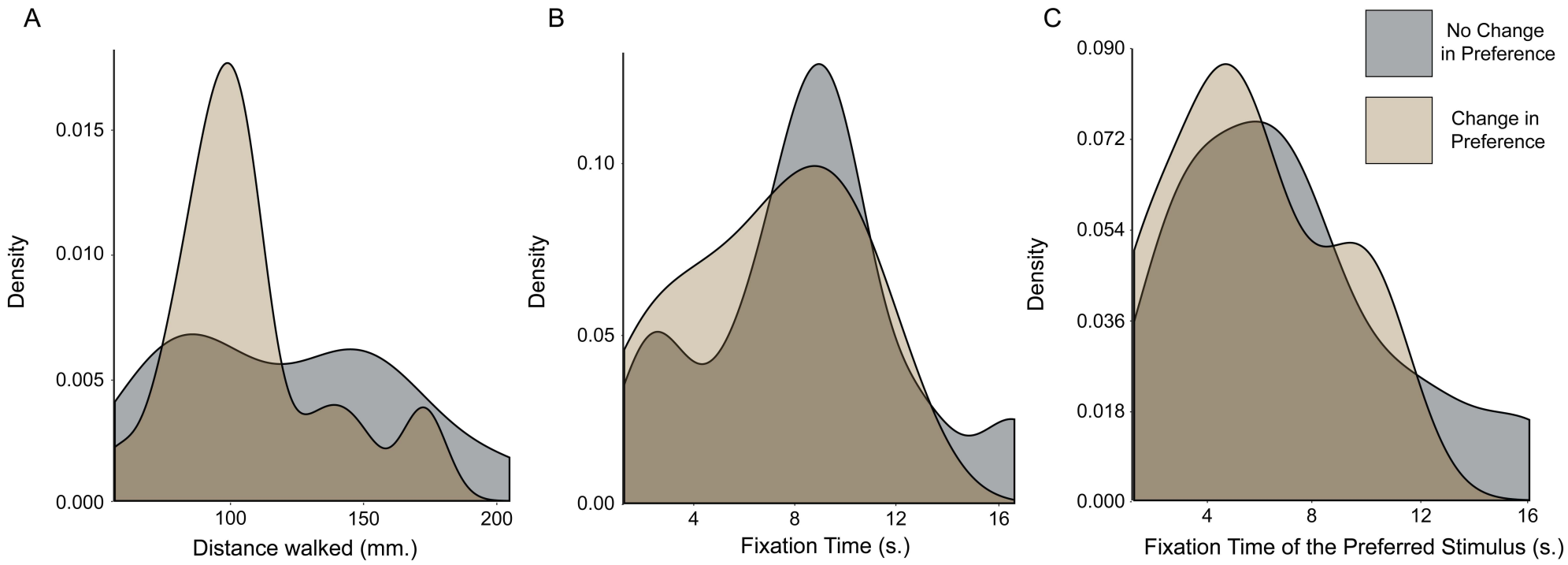

Fig. S5. Density histograms of distance walked and fixation times during the pre-test for the trained group exposed to a green circle and a blue square as a function of the change in preference between pre-test and test phases. There was no difference in the distribution of (**A**) distance walked (t-test, t = -0.99, df = 16.72, p = 0.34), (**B**) total fixation time (t-test, t = -1.03, df = 19.78, p = 0.32) and (**C**) fixation time of the preferred stimuli (t-test, t = 1.03, df = 17.95, p = 0.32) between bees that change preference and bees that did not (sample size: no change in preference = 12, change in preference = 22).

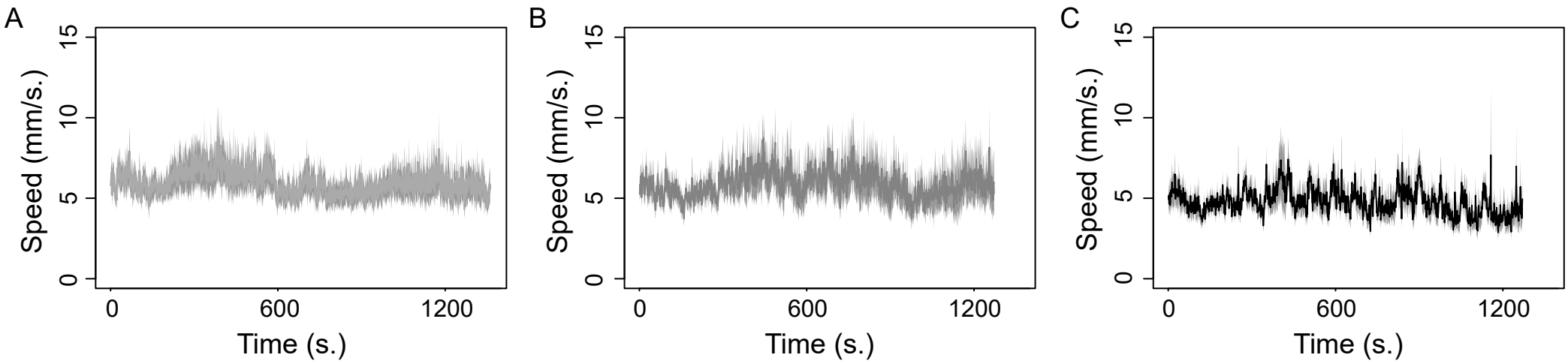

Fig. S6. Average speed and associated sem of naïve (A), unpaired (B) and trained (C) groups across an experiment (pre-test, training and test with blue square and green circle). Bees walked with similar speed level during all the experiment and across treatments.