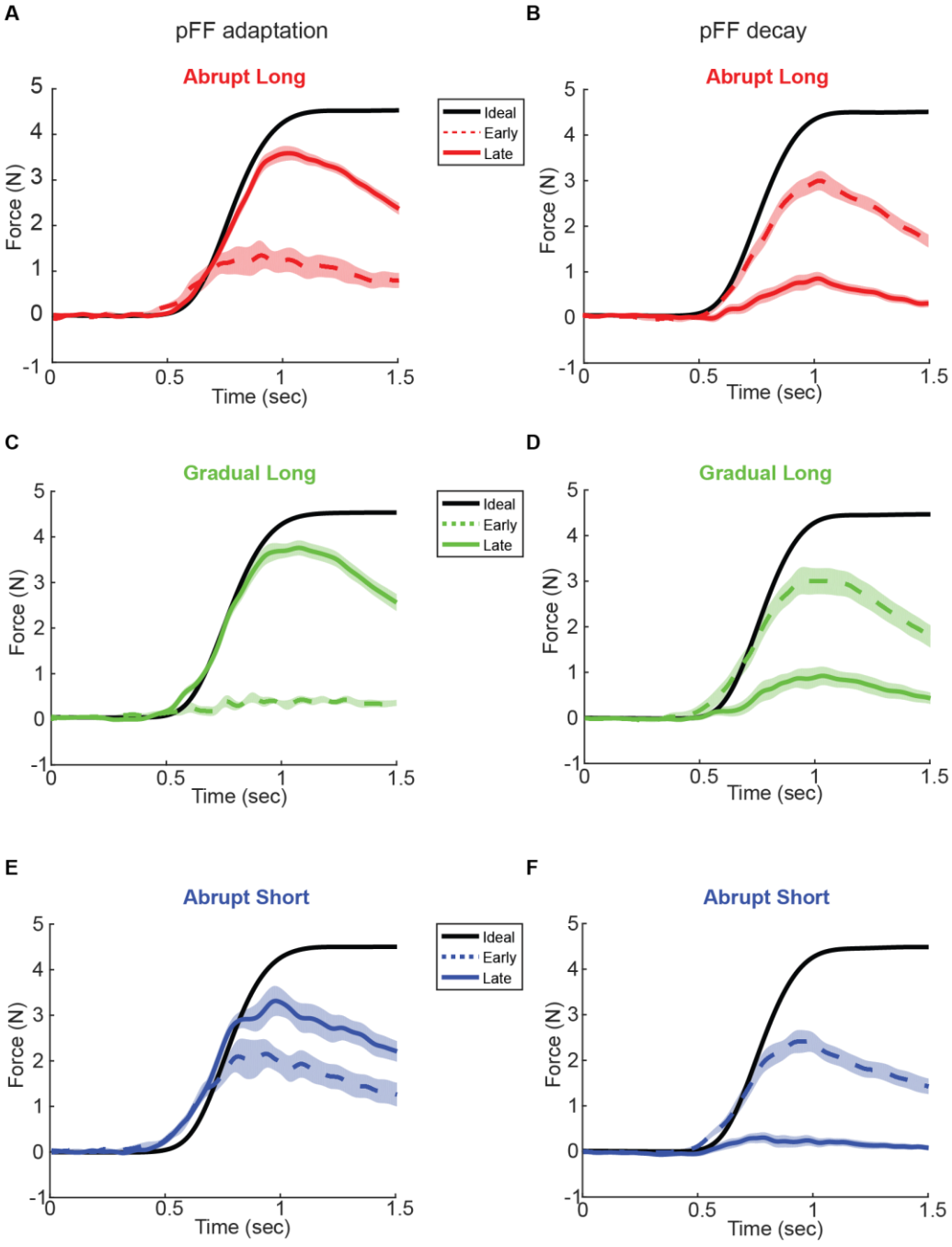
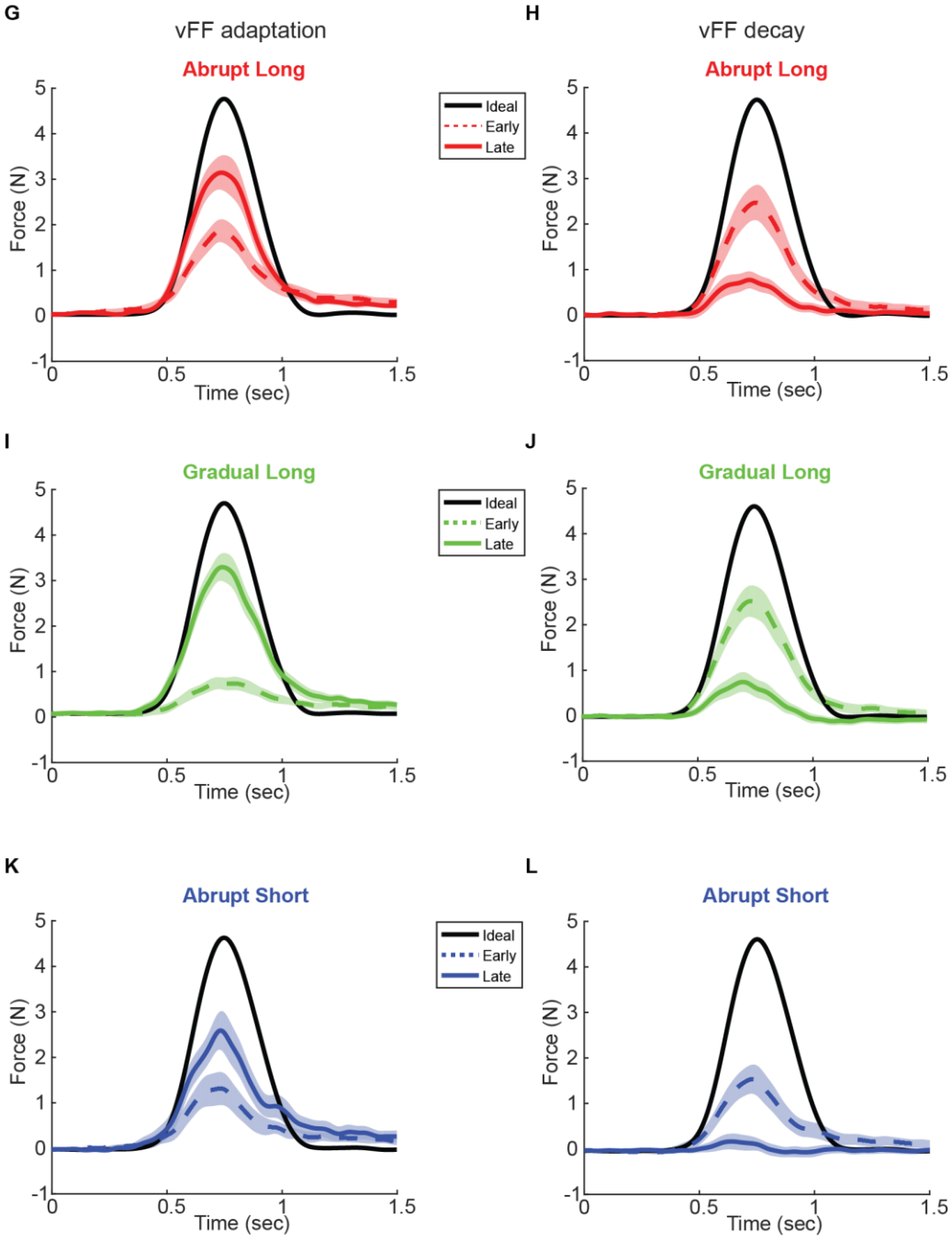
Supplementary Materials

1) Temporal force profiles during adaptation and retention for different exposure rates and training durations

Fig S1 displays population-averaged force-profiles for each of the three training schedules (AL, GL, and AS), and the robot-issued force pattern that participants learned to compensate for (black trace in each panel) measured during EC trials. The left column displays force profiles during the adaptation epoch and the right panel displays force profiles during the retention epoch. Panels A-F and G-L display data related to experiment 1 (pFF) and experiment 2 (vFF) respectively. The ideal force pattern was determined by analyzing the longitudinal movement position or velocity during EC trials. The data were then analyzed within a 1500 ms temporal window centered on the peak velocity. In each panel, we specifically plotted the population-averaged early (first 10% of trials; dashed traces) and late (last 10% trials; solid traces) periods of both the adaptation and retention epochs. Based on inspection, the shape and amplitude of forces appear similar for the three training schedules by the end of adaptation (solid traces in panels A, C & E for pFF and panels G, I & K for vFF). However, during the retention epoch, although AL and GL display similar force patterns during the early and late periods (B & D for pFF, H & J for vFF), AS led to a force trace that was markedly smaller in amplitude with no discernable shape (solid traces in panels F & L) compared to AL and GL during the late period (max force during late period of retention epoch: > ~0.8 N for AL GL, and < ~0.1 N for AS in experiments 1 and 2). In summary, the force patterns presented in Fig S1 appear to be in qualitative agreement with the results from the adaptation coefficient analysis in Fig 2, suggesting a weak effect of exposure rate but a strong effect of training duration on retention. Shaded regions represent the standard error of the mean in each panel.

Figure S1


A
pFF adaptation
Abrupt Long
B
pFF decay
Abrupt Long
C
Gradual Long
D
Gradual Long
E
Abrupt Short
F
Abrupt Short
Ideal
Early
Late
Force (N)
Time (sec)


G
vFF adaptation
Abrupt Long
H
vFF decay
Abrupt Long
Ideal
Early
Late
Force (N)
Time (sec)
I
Gradual Long
J
Gradual Long
K
Abrupt Short
L
Abrupt Short