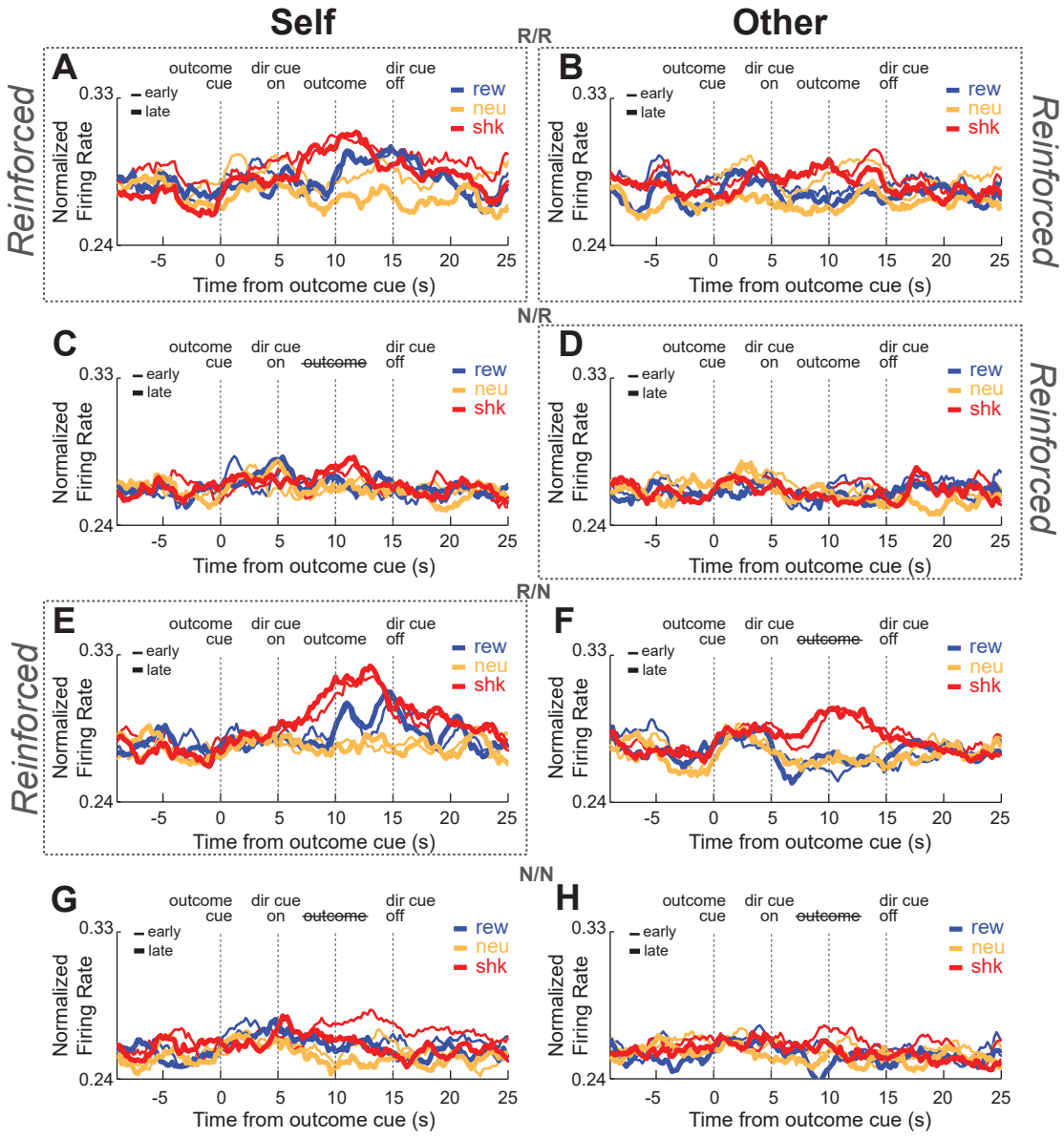
Self
Other
R/R
N/R
R/N
N/N
Reinforced
Reinforced
Reinforced
Reinforced
A
B
C
D
E
F
G
H
outcome cue
dir cue on
outcome
dir cue off
early
late
rew
neu
shk
Normalized Firing Rate
0.33
0.24
-5
0
5
10
15
20
25
Time from outcome cue (s)

Figure S1. Adaptation of ACC activity across trial blocks, Related to Figure 4. A-H) Normalized mean firing rate of all recorded neurons (n = 139), across each reinforcement block type for reward (blue), shock (red) and neutral (orange) trials. Each row shows neural firing for self- and other- outcome trials (as indicated above each column) for each block (Dotted line boxes indicate whether self or other trials were reinforced for that block). Thin lines denote averaged activity for the first half of trials of the block, whereas thick lines represent the latter half of trials. Block transitions result in small but observable carry-over effects from proceeding blocks; these effects are visible as selective responding during nonreinforced (N/N, N/R) blocks and strengthening of responses during R/N blocks. c = cue; dOn = directional light on; o = outcome; dOff = directional light off.

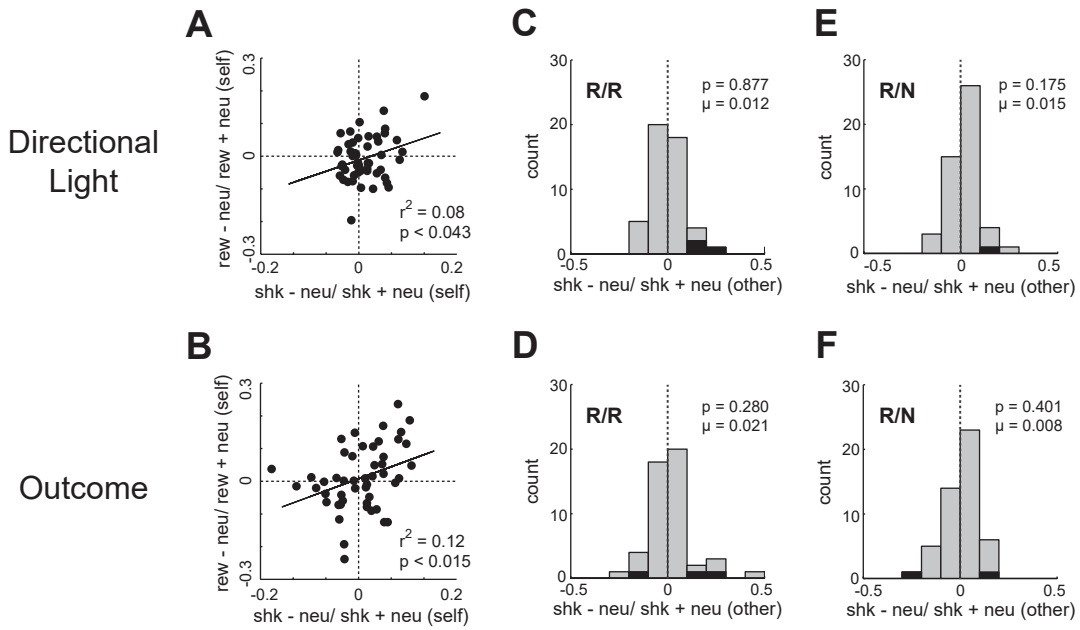
Directional Light
Outcome
A
B
C
D
E
F
rew - neu/ rew + neu (self)
shk - neu/ shk + neu (self)
r2 = 0.08
p < 0.043
r2 = 0.12
p < 0.015
R/R
R/N
p = 0.877
μ = 0.012
p = 0.280
μ = 0.021
p = 0.175
μ = 0.015
p = 0.401
μ = 0.008
count
shk - neu/ shk + neu (other)

Figure S2. ACC neurons do not respond to shock-other trials in non-social contexts, Related to Figure 5. A-B) Correlations between reward or shock indices in self-outcome trials during the directional light (**A**) and outcome (**B**) epochs, during alone sessions (no conspecific present). There was a significant positive correlation suggesting that activity better reflected attention or arousal as in the main text describing sessions where the conspecific was present. N = 49; 6 rats. **C-D)** Distributions of shock-other indices computed for each cell (shock index = shock – neutral/ shock + neutral) for R/R blocks during the directional light (**C**) and outcome epochs (**D**) of the task (black bars represent significant individual cells; Wilcoxon; $p < 0.05$). **E-F)** Distributions of shock-other indices computed for each cell (shock index = shock – neutral/ shock + neutral) for R/N blocks during the directional light (**C**) and outcome epochs (**D**) of the task (black bars represent significant individual cells; Wilcoxon; $p < 0.05$). Unlike, sessions where the conspecific was present, distributions were not significantly shifted in the positive direction (**C-F**).

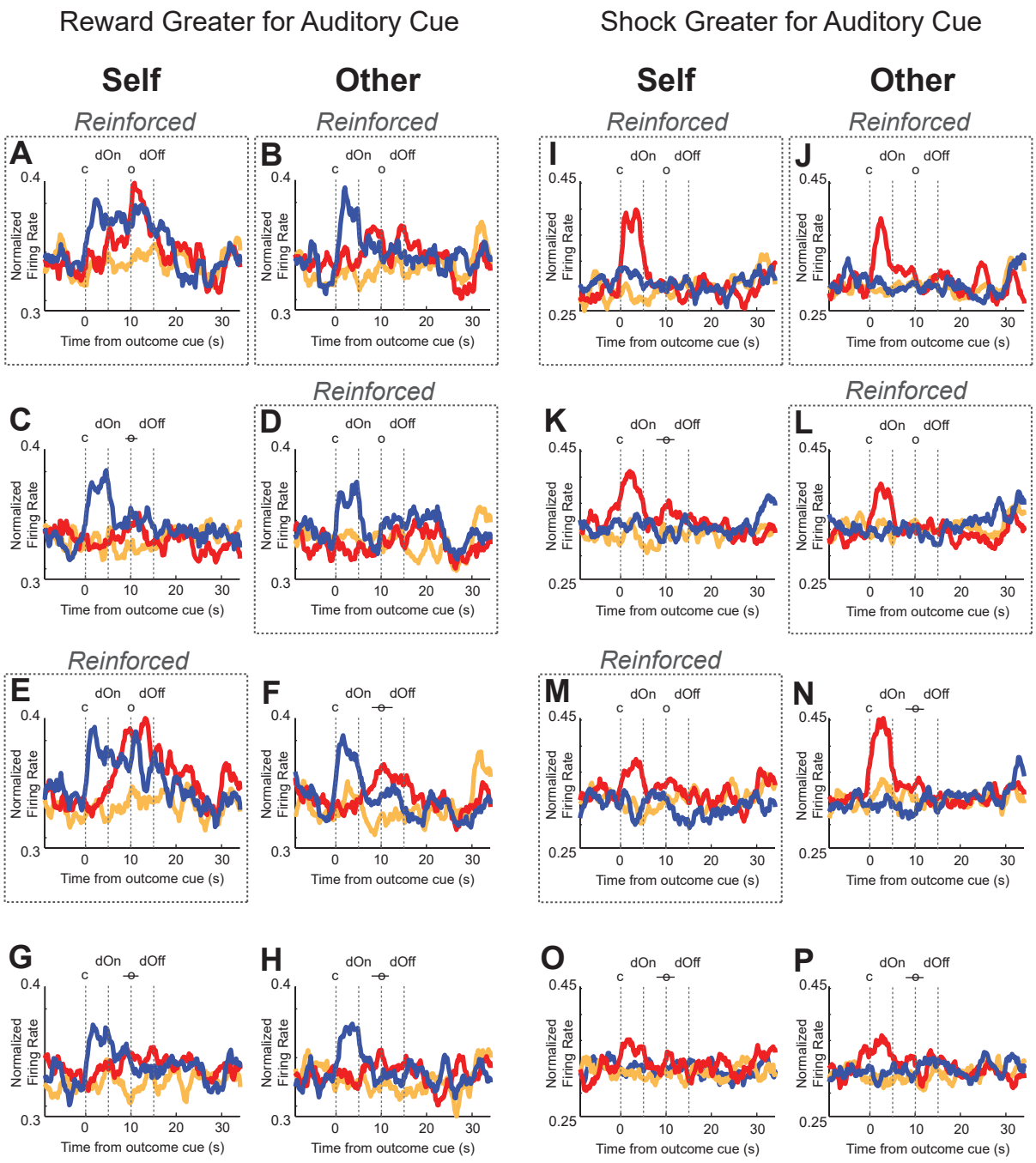
Reward Greater for Auditory Cue
Shock Greater for Auditory Cue
Self
Other
Self
Other
Reinforced
Reinforced
Reinforced
Reinforced
Reinforced
Reinforced
Reinforced
Reinforced
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
dOn
dOff
c
o
Normalized Firing Rate
Time from outcome cue (s)
0.4
0.3
0.45
0.25
0
10
20
30

Figure S3. ACC neurons responsive to auditory cues predicting shock or reward, Related to Figure 4. Normalized mean firing rate of a population of neurons selective to shock (**I-P;** n = 6(4%) or reward (**A-H**; n = 14(10%)) trial-types during the auditory outcome cue epoch (5s between auditory cue onset and directional cue light onset), across each reinforcement block type for reward (blue), shock (red) and neutral (orange) trials. Averaged over blocks where the recording rat was reinforced (i.e., R/R and R/N), these neurons showed significantly stronger firing (Wilcoxon; $p < 0.05$) for either reward-self or shock-self over neutral-self but not for both during the auditory outcome cue epoch. Each row shows neural firing for self- and other-outcome trials (as indicated above each column) for each block (Dotted line boxes indicate whether self or other trials were reinforced for that block). c = cue; dOn = directional light on; o = outcome; dOff = directional light off.

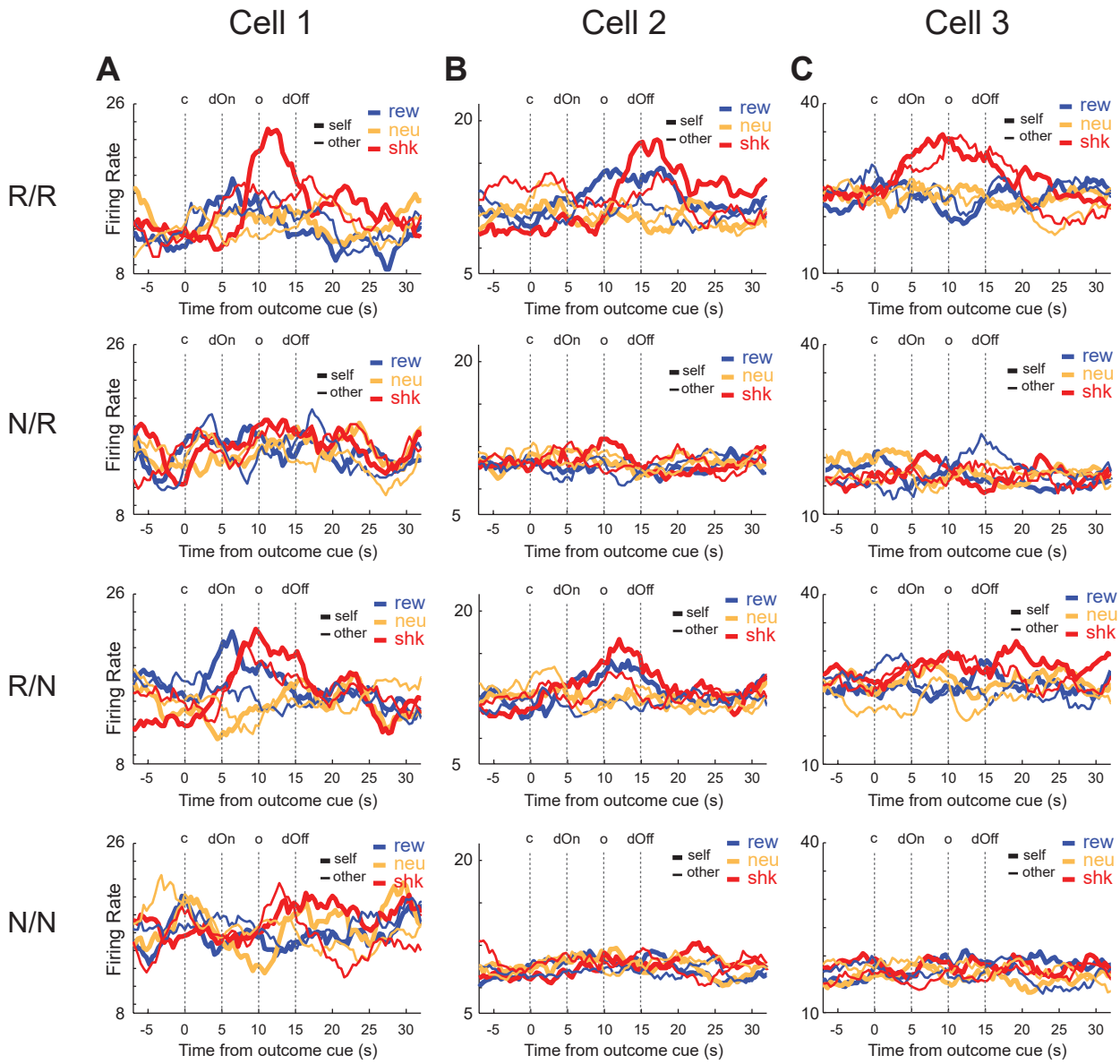
Cell 1
Cell 2
Cell 3
A
B
C
R/R
N/R
R/N
N/N
Firing Rate
Time from outcome cue (s)
c
dOn
o
dOff
self
other
rew
neu
shk

Figure S4. Example ACC neurons responsive to shock, Related to Figure 4. A-C) Firing rate averaged across trials of each reinforcement block type for reward (blue), shock (red) and neutral (orange) trials. Thin lines represent averaged trials for other-outcome trials, whereas thick lines average over self-outcome trials. Each row shows neural firing for self- and other-outcome trials (as indicated above each column) for each block (Dotted line boxes indicate whether self or other trials were reinforced for that block). c = cue; dOn = directional light on; o = outcome; dOff = directional light off. There were 4 different trial blocks (60 trials per block; 10 trials per trial-type), during which both rats received outcomes (R/R; where 'R' designates 'reinforced'; numerator = recording rat; denominator = conspecific), neither rat received outcomes (N/N; 'N' designates which rat was not reinforced), only the recording rat was reinforced (R/N) or only the conspecific was reinforced (N/R).

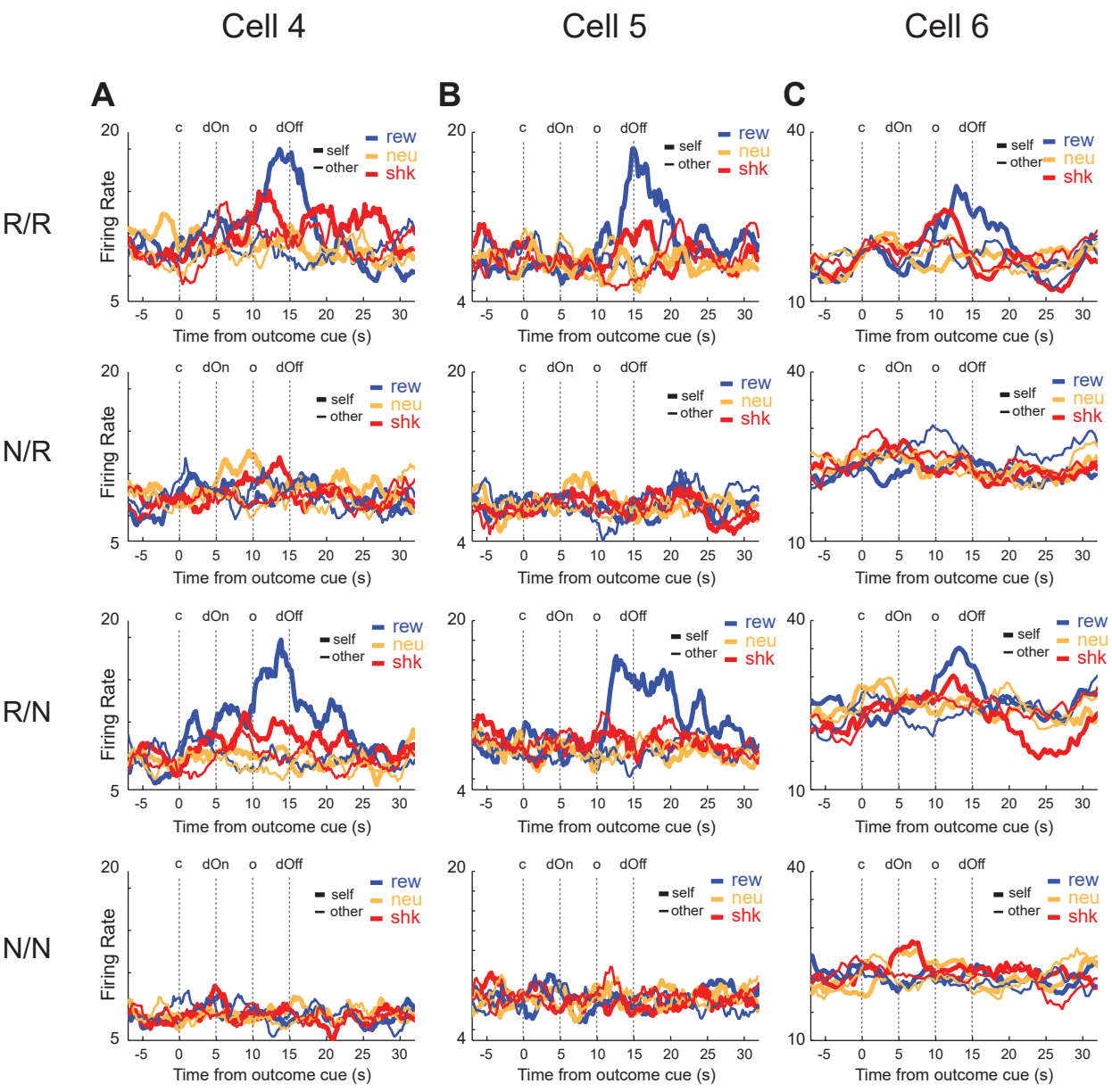
Cell 4
Cell 5
Cell 6
A
B
C
R/R
N/R
R/N
N/N
Firing Rate
Time from outcome cue (s)
c
dOn
o
dOff
self
other
rew
neu
shk

Figure S5. Example ACC neurons responsive to reward, Related to Figure 4. A-C) Firing rate averaged across trials of each reinforcement block type for reward (blue), shock (red) and neutral (orange) trials. Thin lines represent averaged trials for other-outcome trials, whereas thick lines average over self-outcome trials. Each row shows neural firing for self- and other-outcome trials (as indicated above each column) for each block (Dotted line boxes indicate whether self or other trials were reinforced for that block). c = cue; dOn = directional light on; o = outcome; dOff = directional light off. There were 4 different trial blocks (60 trials per block; 10 trials per trial-type), during which both rats received outcomes (R/R; where 'R' designates 'reinforced'; numerator = recording rat; denominator = conspecific), neither rat received outcomes (N/N; 'N' designates which rat was not reinforced), only the recording rat was reinforced (R/N) or only the conspecific was reinforced (N/R).