



Figure 7. The mean proportion OpShort with each condition within each block of three trials in Study 3.

Blocks 2 and 3 (high, then low)—their Block 1 was somewhat lower than expected, perhaps reflecting a lack of knowledge of the rules at the beginning of experiment.¹¹ However, participants in general did adapt in response to the manipulation in the expected directions. Thus, as in Studies 1 and 2, participants overall were able to adapt their strategy use to changing rates of success in the context of a complex, dynamic task.

Individual differences in adaptivity. The remaining analyses focus on whether participants differed in their adaptivity. To address this issue, the participants were classified into adaptive and unadaptive groups using two different criteria: a strict criterion using all three blocks and a lax criterion using only the last two blocks. These analyses involve participants from both conditions, but the definitions of adaptivity will be defined in terms of Condition A (i.e., a medium, low, high pattern) to keep things simple (i.e., the reader can assume that the measures were appropriately reversed or otherwise modified for participants in Condition B). To be classified as adaptive using the strict criterion, the participant's OpShort for the second block had to be lower than in the first block and their OpShort had to be higher in the third block than in the first block (i.e., a medium, low, high pattern). To be classified as adaptive using the lax criterion, the OpShort for the third block had to be higher than that of the second block. According to the lax criterion, 69% (85 of 123) of the participants were adaptive. According to the strict criterion, only 29% (36 of 123) of the participants were adaptive. Thus, only a minority of the participants fully adapted their OpShort use throughout the task, and 31% of the participants did not meet even the very lax criterion of adaptivity.

Was it optimal to follow the expected strategy adaptation patterns? Deciding where to land a plane is only one small component of this complex task. For example, research by others with this task has shown that the very effective (and legal) strategy of moving planes from the queue directly to Hold 1 accounts for much of the performance variance throughout the task (John & Lallement, 1997; Lee et al., 1995). Thus, participants who pay close attention to where to land their DC-10s may be doing so at the cost of paying less attention to other important decisions. In other words, it is possible that OpShort adaptive participants are "penny wise but pound foolish" (i.e., locally optimal but globally suboptimal).

To examine this issue, adaptivity using the strict criterion was regressed against mean block score. Those participants classified as adaptive did indeed have much higher mean block scores than those classified as unadaptive, 3,480 vs. 2,102, $F(1, 121) = 17.1$,

$MSE = 2.83 \times 10^6$, $p < .0001$. However, it is possible that this correlation is mediated by some other ability differences. That is, adaptive participants may have been generally more intelligent and may have performed at higher levels independent of their strategy adaptivity.

When adaptivity was placed in competition with the seven CAM ability measures (or any subset of these seven measures) in a hierarchical multiple regression (with the ability measures entered first) predicting score, OpShort adaptivity continued to be a significant correlate of score ($ps < .05$).¹² Thus, it appears that the correlation between adaptivity and performance is not mediated through indirect correlations with psychometric ability.

Amount and rate of adaptivity. The binary classification of participants into adaptive and unadaptive does not distinguish between participants who adapted only slightly and those who shifted their strategy use a great deal in response to the base-rate manipulations. To examine whether the adaptive participants differed in how much they adapted their OpShort use, a measure of extent of adaptivity was developed: the difference in proportion of OpShort use between the second and third blocks, between which was the largest transition in 747 base rates.¹³ This measure, as a difference in proportions, could range from 0 to 1. Only the 85 participants who showed an increase in OpShort use from Block 2 to Block 3 were included. Figure 8 shows that these adaptive participants varied widely in their extent of adaptivity—40% of the adaptive participants adapted less than .2, and 20% adapted .4 or more.

Another measure of adaptivity is how fast people adapt. This was measured as the proportion of an eventual adaptation made immediately, using the following method, again focusing on the transition from the second to third blocks for which there was the biggest base rate change. Eventual adaptation amount was first calculated—the difference between OpShort on the trial immediately before the transition (i.e., Trial 6) and the largest OpShort value on the three trials after the transition (i.e., maximum of Trials 7, 8, and 9). The amount of immediate adaptation was calculated as the difference between the OpShort for the last trial before a transition and the first trial after that transition (i.e., Trials 6 to 7). Then the amount of immediate adaptation was divided by the eventual transition amount, giving a proportion. A score of 1 reflected adaptation completed entirely immediately, zero reflected no immediate adaptation, and values in between reflected intermediate adaptation rates. Participants who adapted in the wrong direction on the first transition block were assigned a zero on this measure. As with extent of adaptivity, participants who did not adapt from the second to third blocks (i.e., were unadaptive according to the lax criterion) were excluded. Figure 9 shows very large differences in rate of adaptivity ($N = 81$)—20%

¹¹ The difference between conditions in Block 1 was only marginally significant, $F(1, 121) = 1.5$, $MSE = 0.033$, $p < .25$.

¹² The correlations between performance and the psychometric measures were approximately the same whether or not the excluded participants were included—thus, there were no problems of restricted range in these analyses.

¹³ The transition between Blocks 1 and 2 involved a fairly small change in 747 base rates and therefore presents restricted range problems for examining individual differences.