

Table 1
Means and Standard Errors for Each Group Over the First Four Trials for Measures in Study 1 (Ackerman, 1994)

| Measure | Group | | | | | | | | | |
|-----------------------------------|------------------------------|-----------|------------------------------|-----------|---------------------------------------|-----------|-----------------------------------|-----------|-------------------------------------|-----------|
| | Excluded (<i>n</i> = 23) | | Adaptive (<i>n</i> = 21) | | Unadaptive high (<i>n</i> = 1) | | Unadaptive low (<i>n</i> = 4) | | Unadaptive other (<i>n</i> = 8) | |
| | <i>M</i> | <i>SE</i> | <i>M</i> | <i>SE</i> | <i>M</i> | <i>SE</i> | <i>M</i> | <i>SE</i> | <i>M</i> | <i>SE</i> |
| OpShort adaptivity | — | — | .23 | .03 | -.14 | .00 | -.07 | .04 | -.02 | .02 |
| Planes landed | 25.0 | 1.2 | 30.5 | 1.2 | 24.3 | 0.0 | 24.6 | 0.7 | 25.7 | 3.3 |
| Errors | 10.1 | 1.6 | 12.9 | 1.4 | 4.8 | 0.0 | 13.3 | 3.0 | 8.3 | 3.1 |
| Crashes | 1.4 | 0.3 | 1.2 | 0.2 | 0.3 | 0.0 | 1.1 | 0.3 | 1.9 | 0.7 |
| Key presses | 993 | 49 | 1054 | 60 | 929 | 0 | 991 | 103 | 914 | 71 |
| Calls of Rule IV | 0.2 | 0.1 | 0.4 | 0.3 | 0.0 | 0.0 | 0.4 | 0.2 | 3.0 | 1.8 |
| Ravens Progressive Matrices score | 33.0 | 1.6 | 34.6 | 1.3 | 39.0 | 0.0 | 25.2 | 5.2 | 32.0 | 2.2 |

quite similar (0.81 for Study 1 and 0.88 for Study 2). Figure 6 presents a histogram of OpShort adaptivity in Study 2. In this case, the modal group (0.05 to 0.15) did include the mean adaptivity level across all participants (0.14). However, one third of the participants showed adaptivity levels that were two or more times as high as the mean, and over 30% of the participants showed no adaptivity at all.

Again, we can ask how well these individual differences in strategy adaptivity correlate with performance in the task. We used the mean number of planes landed per trial over Trials 19–22 (the range over which adaptivity was assessed) as the measure of performance. OpShort adaptivity correlated positively with planes landed ($r = .52, p < .001$)⁸ at even higher levels than in Study 1. As in Study 1, adaptivity is a somewhat weaker predictor of performance than the best individual difference battery measures—the four best predictors correlated in the .62 to .65 range. The top eight predictors (all with $r_s > .44, p_s < .01$) involve a mix of perceptual speed, psychomotor ability, and reasoning ability. If one enters OpShort adaptivity and these eight psychomotor tests

into a hierarchical multiple regression (with the eight psychomotor tests entered first) predicting planes landed, OpShort continues to have a significant contribution (partial $r = .41, p < .01$). As with Study 1, there were no restriction of range issues: The individual difference battery measures correlated no better with performance in the full data set than in the reduced data set for which there were minimum numbers of 5. Thus, both in early training and later in training after changes in the environment, adaptivity appears to correlate with performance directly and not through indirect correlations with other determinants of performance—because the direct correlations were larger than correlations along the indirect path.

What predicts adaptivity? To examine whether adaptivity was again associated with performance on the psychometric ability tests, the 22 psychometric scores were correlated with OpShort adaptivity (minimum $N > 5$). Only two tests produced significant correlations: Patterns ($r = .39, p < .03$) and Letter–Number Substitution ($r = .35, p < .05$). Although both of these tests are supposed to be measures of perceptual speed, when a factor analysis (principal-factor extraction with varimax orthogonal rotation) is conducted, they both load either primarily or heavily on reasoning and memory factors. Once again, the numbers are too low to be sure that these factors and not others are really the best predictors. Yet across Studies 1 and 2, the evidence suggests that some aspect of reasoning ability and possibly psychomotor ability or perceptual speed may be associated with adaptivity. This issue, among others, is explored further in Study 3.

Study 3: Strategy Adaptivity to Manipulated Base Rates

The analyses of Studies 1 and 2 suggest that people are generally adaptive in their strategy use and that there are important individual differences in this strategy adaptivity to success rates, both early in training and later on. However, the measure of strategy adaptivity used in those studies had one very important flaw: It was defined relative to the participants' self-created successes and failures (i.e., it was a correlational measure). It is possible that the participants differed in the kinds

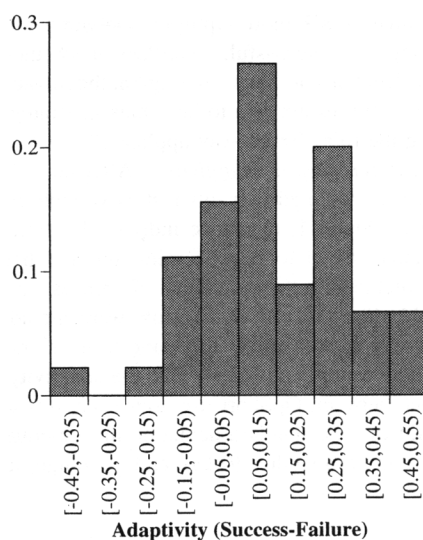


Figure 6. Ackerman Study 2, histogram of individual OpShort adaptivity to the success of the previous short-runway landing attempt. Each range runs from the lower value (inclusively) to the upper value (exclusively).

⁸ Because 5 of the participants were missing some of the psychometric test scores, the number for these correlations was 40. Using only these participants, OpShort Adaptivity correlated at $r = .58$ with planes landed.