learning spatial ($r = .47, p < .0001$). All the best models included these three predictors. Thus, although inductive reasoning does enter into extent of adaptivity, working memory and fact learning also seem to play an important role.

Do the same factors predict rate of adaptivity? A similar all-possible-regressions procedure was conducted using as a dependent measure the amount of immediate adaptation described earlier, again including only those participants who showed a positive increase in OpShort use. The best model included the top two correlates (multiple $r^2 = .19$): skill learning spatial ($r = .37, p < .001$) and processing speed spatial RT ($r = -.31, p < .01$). For this measure, inductive reasoning was a very poor predictor ($r = .09, p > .4$). Thus, rate of adaptivity appears to depend on different factors. Of course, it is important to note that none of the psychometric measures were particularly good predictors of rate of adaptivity. Once again, these weak correlations with rate of adaptivity may be due to higher noise levels from using trial level rather than block level data in its calculation.

Micro- versus macroadaptivity. Up to this point, the analyses of Study 3 have focused on the macrolevel adaptivity to the base-rate manipulation. What about the microlevel adaptivity that was examined in Studies 1 and 2? As in Studies 1 and 2, participants were also sensitive to local feedback: They were more likely to select the short runway after a successful landing attempt than after an unsuccessful landing attempt (mean OpShort of .42 vs. .33, $F(1, 113) = 32.4$, $MSE = 0.015$, $p < .0001$, for DC–10s, for Trials 1–9). To examine individual differences, micro-OpShort adaptivity was calculated as in Studies 1 and 2: the difference between the proportion of OpShort after successful landing attempts and the proportion of OpShort after unsuccessful landing attempts. This measure had a mean of .09 and a standard deviation of .17. Twenty-six percent of the participants showed no adaptivity at all on this measure.

There was a modest but significant correlation between this microlevel adaptivity and macrolevel adaptivity, as defined as adapting OpShort at all ($r = .19, p < .05$) or as defined as the extent of adaptivity from the second to the third block ($r = .17$, $p < .06$). There was also a small but significant correlation between microlevel adaptivity and performance in the task ($r = .23, p < .02$). This correlation of microlevel adaptivity and performance is much lower than that found in Studies 1 and 2. This finding may indicate either that (a) microlevel adaptivity is less important over the course of shifting base-rates manipulations or (b) that we have not adequately measured microlevel adaptivity in this shifting base-rate situation. Because this measure of microlevel adaptivity has an even lower correlation with performance in the first block in which no base-rate manipulation had yet occurred ($r = .17, p < .1$), the first alternative seems unlikely. Thus, the weak correlations with microlevel adaptivity are more likely to reflect some bias or extra noise in its measurement in this particular study.

General Discussion

This article has further explored a new conception of individual differences: differences in strategy adaptivity, specifically adaptivity to changing success base rates (see also Reder & Schunn, 1999; Schunn & Reder, 1998). The three studies found evidence for significant individual differences in sensitivity to success rates, both at a microlevel (all three studies) and at a global level (Study 3). These individual differences were not attributable to chance variation because they were strongly associated with performance and because they could be predicted using cognitive-ability test batteries—most commonly predicted by reasoning ability. Study 3 also found evidence that individuals differ in terms of whether they adapt, the extent to which they adapt, and the rate at which they adapt. The differences did not seem attributable to differential knowledge of the task or to general intelligence differences.

How do our findings compare with other investigations of individual differences in the KA–ATC task? Lee, Anderson, and Matessa (1995; Lee & Anderson, 1997) found that differences in overall strategy use accounted for a large proportion of performance differences in the task.[14] This raises the question of whether the adaptive participants had more complex strategies rather than selecting among the same set of strategies more adaptively. For example, the adaptive participants may have had different explicit strategies for the different plane ratios (e.g., if the ratio of 747s is high, then use the short runway whenever possible). This alternative interpretation would make the observed differences consistent with the strategy-differences view of individual differences. However, it is important to note that the adaptive participants never shifted their OpShort levels in a binary fashion (e.g., from always using the short runway to never using the short runway). Instead, the participants merely changed the degree of short runway use. This kind of continuous shift is much more consistent with changing ratios of strategy use than is shifting from one strategy to another. Moreover, the participants also differed in terms of extent of adaptivity and rate of adaptivity, which is difficult to explain using just different strategies. One might ask whether the strategy differences observed by Lee et al. were in fact due to adaptivity differences. Perhaps more adaptive participants were better able to select appropriate strategies. Whatever the answer, the adaptivity- and strategy-differences approaches are complementary in that both emphasize the importance of strategies in the analysis of performance (Reder, 1982, 1987, 1988).

Coming from a parameter-differences approach, Ackerman (1988, 1989, 1990) focused on the relationship between predictors of performance and extent of training within the KA–ATC task. He found that different factors predicted performance at different phases of training: first reasoning ability, then perceptual speed, and finally reaction-time ability. Our studies also found that reasoning ability and processing speed were important components of performance. One potential contribution of this article is to provide an explanation for the relationships between the cognitive-skills assessment battery and task performance: The relationship is strongly mediated by differences in strategy adaptivity. Thus, the adaptivity-differences approach provides a link between the parameter- and strategy-differences approaches: Different strategies are selected because of different strategy adaptivity, which is related to parameter differences. Strategy selection is a process and as such may be affected by parameter differences in the cognitive architecture—differences in reasoning ability, working memory capacity, and processing speed.

In addition to the theoretical importance of understanding the nature of individual differences and the mechanisms underlying

[14] They focused on a strategy relating to moving planes from the queue to the hold patterns rather than on the strategies in this paper—runway use strategies.