fulness of a strategy on the immediately preceding attempt at using that strategy. For example, if one attempts to run on an icy surface and falls, one should be less likely to attempt to run on such a surface the next time. If the attempt is successful, one should be more likely to attempt to run the next time. This is similar to simple operant conditioning. Sensitivity to rates of success at the global level refers to changing strategy use in response to changes in the frequency of success defined over many of the past strategy attempts. For example, if a student first experiences 50% failure rates with a strategy for solving algebra problems and then later experiences 5% failure rates once some level of expertise has been reached, then that student should begin to use the strategy more often.

What is the relationship between micro and global sensitivity to success rates? Logically, if an individual is consistently sensitive at the microlevel, then the individual must be sensitive at the global level—the incremental sensitivity sums to at least some level of global sensitivity (although even greater levels of global sensitivity are possible). However, the reverse is not necessarily true. An individual may be sensitive at the global level but insensitive at the microlevel. For example, it may be that only large changes in success base rates measured over many trials result in changes in strategy use. Thus, this article will measure sensitivity at both the microlevel and global level to assess whether there are individual differences at both levels.

In this article, data from three studies are presented; the first two studies focused on microlevel sensitivity and the third study focused on global sensitivity. All three studies involved a particular dynamic task, the Kanfer–Ackerman Air Traffic Controller Task (KA–ATC; Ackerman & Kanfer, 1994), chosen because dynamic tasks bring to the forefront the importance of ability to adapt to changing success rates. Moreover, individual differences in this task have been studied before, both from a parameter-differences approach and from a strategy-differences approach. Coming from the parameter-differences approach, Ackerman (1988, 1989) found that what predicts individual differences in performance in this task is moderated by time in training: Early in training, reasoning ability best predicts performance; later in training, perceptual-speed ability best predicts performance; and by the end of training, simple reaction-time ability best predicts performance. By contrast, coming from the strategy-differences approach, Lee, Anderson, and Matessa (1995; Lee & Anderson, 1997) found that strategy differences predict individual differences in performance in the KA–ATC task at all points of training. Thus, the KA–ATC task is a good task for contrasting the strategy-adaptivity approach with the strategy-differences and parameter approaches. Before presenting the studies, the next section presents an overview of the task.

The Kanfer–Ackerman Air Traffic Controller Task

The KA–ATC; (Ackerman & Kanfer, 1994; Kanfer & Ackerman, 1989) was designed to simulate dynamic aspects of real air traffic control (e.g., weather conditions change, planes lose fuel in real time, certain types of planes require longer runways than others).[2]

The object of the KA–ATC task is to accumulate as many points as possible. Points are earned by landing planes (+50 points) and are lost by rule violations (−10 points) or plane crashes (−100 points). Crashes occur when a plane is allowed to run out of fuel before it is landed. In the KA–ATC task, participants must monitor a variety of elements that are displayed on the screen (see Figure 1): (a) 12 hold-pattern positions that are divided into three altitude levels; (b) four runways—two short and two long, one of each running north–south and the other running east–west; (c) a queue of planes waiting to enter into the hold positions (each queued plane is a dot); (d) two message windows (not shown), one indicating changes in runway conditions (dry, wet, or icy), wind speed (0–20, 20–40, 40–60 knots) and direction (N, S, E, or W) and one providing error feedback; and (e) the current score and penalty points. A weather change occurs approximately every 25 s; planes enter the queue every 7 s.

There are six rules governing this task. First, planes must land into the wind (e.g., use a north–south runway rather than an east–west runway if the wind is coming from the north or south). Second, planes can only land from Hold Level 1 (the lowest level). Third, planes can move down only one hold level at a time and only into an unoccupied position. Fourth, the current weather conditions and wind speed determine the runway length required by different plane types (747s always require long runways, DC-10s can use short runways if runways are not icy and the wind speed is less than 40 knots, 727s can use short runways only when the runways are dry or wind speed is 0–20 knots, and propeller planes (PROPs) can always use short runways). Fifth, planes with less than 3 min of fuel remaining must be landed immediately—points are subtracted even if the plane does not crash. Sixth, only one plane at a time can occupy a runway. Each violation of any of these rules produces a 10-point penalty.

The task consists of a sequence of 10-min trials, with the total number of trials varying from study to study. Each trial begins with planes already in various hold positions and other planes in the queue (as in Figure 1). The number of minutes of fuel left for each plane is indicated at all times and decreases in real time. At the end of each trial, the participant is given a short, self-timed break. The next trial begins with a new screen display and the cursor at the top of the screen.

The primary data for the KA–ATC task are taken from the keystroke protocol produced by the computer interface. The set of possible keystrokes on the computer keyboard includes up-arrow, down-arrow, F1, enter, and the number keys 1–6. The up-arrow and down-arrow keys move the cursor up and down (respectively) between the different hold positions and runways to indicate where planes are to be moved or landed. The F1 key accepts the planes from the queue into a holding pattern. The Enter key serves one of three functions, which is determined by the context: (a) it selects the plane in the hold corresponding to the current location of the cursor; (b) it moves a selected plane (either from the queue or from another hold position) into an empty hold position, indicated by the current location of the cursor; or (c) it lands a plane on the runway, if the cursor is next to one of the runways. The six number keys each display one of the six rules described earlier. These rules can be displayed at any time.

At the beginning of the task, before the first 10-min trial, the participants are given step-by-step instructions for the task. Once the task begins, the participants cannot refer back to the instructions and must rely on their memory or use the rule keys to display the six rules.

The KA–ATC task involves three primary subtasks: (a) accepting a plane from the queue into a hold position; (b) moving planes within the hold positions; and (c) landing planes. Although previ-

[2] The following description of the KA–ATC task is an abbreviated paraphrasing of the task description found in Ackerman & Kanfer (1994).