

faces similar challenges. Air traffic controllers, commercial pilots, and medical personnel working in hospital intensive-care units or emergency rooms all must process a great deal of information from different monitors and instruments—much of it arriving simultaneously—and respond quickly and appropriately. Mistakes in any of these jobs can be costly. The following example, quoted in a study of the design of auditory warning sounds in airplane cockpits (Patterson, 1990), illustrates how too much incoming information can lead to a breakdown in task performance:

I was flying in a Jetstream at night when my peaceful reverie was shattered by the stall audio warning, the stick shaker, and several warning lights. The effect was exactly what was not intended; I was frightened numb for several seconds and drawn off instruments trying to work out how to cancel the audio/visual assault rather than taking what should be instinctive actions. The combined assault is so loud and bright that it is impossible to talk to the other crew member, and action is invariably taken to cancel the cacophony before getting on with the actual problem. (p. 37)

Clearly, people who design equipment and instruments should know how people process large amounts of information and how much information we can process at one time. System designers often consult human factors psychologists, who study just these sorts of issues (Wickens, Lee, Liu, & Gordon-Becker, 2003).

My goal in this chapter is to explain what is going on, cognitively speaking, in the preceding examples. More specifically, we will examine the issue of mental resources and how they are assigned to various cognitive tasks. We will first explore the notion of mental concentration. In particular, I will try to explain what “paying attention” to someone or something means. You will see that at least part of paying attention is concentrating—shutting out other activities or information to devote more mental resources to the object on which you want to focus.

Next, we will examine **divided attention**, the ability to simultaneously allocate cognitive resources to

different tasks. Can a person perform two cognitive tasks at exactly the same time? We will see that the answer depends on what the specific tasks are and what the performer’s level of practice is with each. For many tasks, extensive practice can result in the task’s becoming so easy and effortless that performing it requires little attention. When this happens, performance is said to be automatic. This can mean, among other things, that attention is freed up for a person to do another task simultaneously with the automatic one. We will examine some recent proposals about the relationship between attention and automatic processing.

We will next take a look at what some recent work in cognitive neuropsychology tells us about the brain mechanisms involved when people “pay attention.” We will see that particular areas of the brain seem to become active when we pay attention or refocus our attention, and we will see that information that is attended to elicits different responses in the brain from those elicited by unattended information.

Like many topics in psychology, attention captured the interest of William James during the late 1800s. James (1890/1983) anticipated the recent writings of investigators studying attention when he argued that only one system or process of conception can go on at a time very easily; to do two or more things at once, he believed, required that the processes be habitual. James’s description of attention, as clear today as it was a century ago, ably sums up the phenomenon psychologists study when they investigate attention:

*Everyone knows what attention is. It is the taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought. Focalization, concentration, of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others, and is a condition which has a real opposite in the confused, dazed, scatterbrained state which in French is called *distraction* and *Zerstreuung* in German. (pp. 381–382)*