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## JUDGMENT AND DECISION PROCESSES IN OLDER ADULTS' COMPLIANCE WITH MEDICAL REGIMENS

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A recent trend in health care is characterized by increases in patient autonomy and shared medical decision making between patients and their doctors or health care providers. Medical decisions are no longer made solely by physicians, because patients are increasingly encouraged to play an active role in researching their own illnesses and deciding which treatment options they will pursue. This shift in medical decisions from doctor to patient has the potential to affect the health care of older adults negatively. Substantial research in cognitive aging indicates that older adults frequently have more difficulty comprehending and remembering medical information compared with younger adults (e.g., Brown & Park, 2002; Halter, 1999; Morrell, Park, & Poon, 1989; Park & Kidder, 1996). These deficits in information processing may translate into suboptimal decision making as older adults are increasingly expected to play a more active role in researching their illnesses, choosing between multiple treatment options, and planning how they will implement new medical behaviors.

Although considerable research on aging and decision making has focused on studying the effects of aging on patients' ability to make competent decisions regarding consent to treatment (see Appelbaum & Grisso, 1998), it is also increasingly important to investigate older patients' normative decision-making skills—how they make decisions that maximize utility (Kahneman & Tversky, 2000)—and to assess the processes and outcomes of their decisions. Important skills include weighing the risks and benefits in selecting and eliminating medications and treatments from consideration (Deyo, 2001) and accurately estimating the likelihood of future outcomes (Yates & Patalano, 1999). The burgeoning availability of medical information on the Internet has increased patients' ability to access medical information and advice from a variety of sources, including other physicians and other patients, with obtaining health information being cited as one of the most common uses for the Internet (Morrell, Mayhorn, & Bennett, 2000). For all of these reasons, how older adults evaluate and integrate medical information from different sources in making medical decisions has become a vital topic for investigation.

In this chapter, we discuss the impact of aging on older adults' ability to make medical decisions that are relevant to following doctors' instructions. Within the scope of this discussion, we use the term *medical judgment* to describe the cognitive processes involved in estimations of likelihood, ranking the relative likelihood of different outcomes, and assessments of severity. A *medical decision*, in turn, represents a choice that is made after alternatives with different attributes are weighed and compared. The ability to make sound medical judgments and decisions is determined by a complex interaction of factors, including age-related changes in information-processing ability and cognitive biases that are automatically elicited by the use of well-known cognitive heuristics. Consequently, older adults' success on decision-making tasks can be measured by examining both measures of process and outcome. We first present a brief survey of changes in information-processing abilities that accompany aging (for a detailed discussion, see chap. 5, this volume) and that provide the backdrop for older adults' performance of medical judgments and decisions. We continue with a discussion of how these age-related changes fit into a well-articulated theoretical framework of judgment and decision making. Then we present evidence for how age-related changes in cognition induce differences in strategy use among older adults and discuss how these age differences in cognitive function and strategy translate into decision-making outcomes. Finally, we propose some directives on how the interplay of aging and information processing can be taken into consideration when presenting medical decisions to older adults.

## AGE-RELATED CHANGE IN COGNITIVE FUNCTION

Although judgments and decisions are considered to be distinct processes, judgments often form the backdrop for future decisions. Judgments encompass a wide range of behaviors that include the ability to weigh multiple pieces of information, rank the likelihood of various outcomes, and assess the severity of outcomes; decisions also encompass the choice among multiple options and the selection of options that represent solutions to a problem or a scenario (Yates & Patalano, 1999). Consider, for example, an older adult woman who begins to experience a collection of symptoms, including a sore throat, sneezing, coughing, and runny nose. Between the time of symptom onset to the time she receives treatment, she will make a number of judgments regarding the severity of her symptoms and estimate their frequency of occurrence; she will make decisions about how to react on the basis of the outcomes of these judgments. She may attempt to determine whether these symptoms are indicative of a cold or a seasonal allergy by judging the overall similarity of the collection of symptoms to her cognitive representation of colds and allergies. If she regards the symptoms as severe enough to treat and estimates that their occurrence will be infrequent, she may decide to purchase an over-the-counter remedy. On the other hand, if the symptoms occur with high frequency, she may decide to make a doctor's appointment and request a prescription medication. There are, of course, judgments of severity of the symptoms, but in this section we focus on the judgments of likelihood.

Once the decision is made to seek treatment, the patient is faced with the task of selecting a medication from several that are available. Table 9.1 is a hypothetical tabular summary of a possible array of choices with key accompanying features. Although this organization of options as an Alternative  $\times$  Attribute matrix (Payne, 1976) is useful for the purposes of presentation in an academic chapter, an older adult who is collecting information about each drug in a naturalistic setting (e.g., a drug store or a doctor's office) is unlikely to receive this type of summary. Instead, the patient will likely face the task of learning the features of each medication individually. Consequently, the patient in this case must make multiple evaluations and judgments on her own, such as choosing the method of drug administration (e.g., oral or nasal), determining which side effects are acceptable and which are not, and establishing how much she is willing to pay. If she is making these decisions within a doctor's office or a drugstore, there is additional time pressure as well. Finally, she must also select a treatment that she is relatively confident she can remember to carry out at home. If she is not

TABLE 9.1  
Alternative × Attribute Matrix

Drug option	Price (30-day supply)	Administration	Availability	Most common side effects
Drug A	Excellent	Oral (swallow)	OTC	Excitability, drowsiness, sleep disturbance
Drug B	Poor	Oral (swallow)	Prescription	Coughing, upper respiratory tract infection, back pain
Drug C	Excellent	Oral (swallow)	OTC	Drowsiness, excitability, dry mouth
Drug D	Very good	Oral (swallow)	OTC	Headache, drowsiness, fatigue
Drug E	Excellent	Nasal spray	OTC	Burning, stinging, sneezing
Drug F	Fair	Nasal spray	Prescription	Sneezing, stuffy nose, unpleasant taste/smell
Drug G	Fair	Nasal spray	Prescription	Headache, dry nose, throat irritation
Drug H	Poor	Inhaler	Prescription	Headache, nosebleed, sore throat
Drug I	Very good	Inhaler	OTC	Nervousness, rapid heart beat, heart problems
Drug J	Fair	Nasal spray	Prescription	Nosebleed, nasal/throat irritation, cough
Drug K	Poor	Oral (chew)	Prescription	Diarrhea, stomach upset, cough
Drug L	Very good	Oral (swallow)	OTC	Nervousness, dizziness, sleeplessness
Drug M	Good	Inhaler	Prescription	Nasal dryness/irritation, burning, stinging
Drug N	Good	Oral (swallow)	Prescription	Drowsiness, dry mouth

Note. A matrix depicting popular brands of allergy medication. OTC = over the counter.

confident of her ability to do so, she may opt to visit the doctor regularly to receive allergy shots instead.

Thus, the decision to seek treatment for an ailment comprises a number of cognitively demanding tasks in which options previously seen must be remembered while new options are being considered. In the above example, the decision of whether to purchase one drug versus another will be guided by a set of judgments, such as those involved in ranking the drugs according to personal preferences for how they are administered and the severity of accompanying side effects. Consequently, the decision outcome will be based on these judgments and the relative importance of these dimensions to the decision maker. The molar task of making a medical judgment or decision regarding an ailment thus consists of a number of subprocesses, including remembering previously seen options, ranking them by relative importance, and executing a decision outcome that is consistent with this evaluation. Each of these subprocesses taps a number of cognitive functions, all of which change with age.

### Effects of Age-Related Declines in Memory and Processing

Because judgments and decisions frequently depend on balancing a constellation of information including personal preferences, risks, and benefits, the performance of optimal judgment and decision making requires a great deal of online processing. Considerable work in cognitive aging has shown that online-processing components of cognition, such as working memory and processing speed, show marked declines in older individuals (Park, 2000; Salthouse & Babcock, 1991), and age-related changes in cognition have the potential to affect older adults' performance of nearly all of the processes that underlie judgment and decision making.

Decreases in working memory capacity are characterized by declines in the ability to store and manipulate multiple pieces of information simultaneously in conscious awareness. *Slowing in processing speed* refers to declines in the ability to complete a task accurately but quickly under time constraints, and the effects of slowing in processing speed are often most evident when older adults are faced with novel situations or must make decisions within a time limit (Park, 2000). Under time constraints, older adults may require more time to make an optimal decision compared with younger adults.

Given the multiple cognitive declines that occur with age, aging is frequently hypothesized to have a generally negative impact on judgment and decision processes (Peters, Finucane, MacGregor, & Slovic, 2000), representing a combination of changes in physiological function. Both decreases in frontal lobe volume (Raz, 2000; Scheibel, 1996) and increases in bilateral recruitment of brain regions (Reuter-Lorenz, Stanczak, & Miller,

1999) appear to accompany advanced age, and research is beginning to shed light on how these physiological changes might lead to a host of psychological changes, such as an increased reliance on the limbic system and increased attention to emotional information (Blanchard-Fields, 1998). Substantial evidence suggests that older and younger adults make decisions differently and that they arrive at these decisions using not only different strategies but through different physiological pathways.

Furthermore, physiological differences may underlie some of the more general characteristics of decision-making styles. Older adults are generally believed to reason in a more top-down fashion compared with younger adults' bottom-up, data-driven style of thinking (Sinnott, 1989). This has been characterized by others as an age-related increase in affective styles of processing (Blanchard-Fields, 1998), theory-driven or heuristic processing (Mutter & Pliske, 1994), or risk aversion in the sense of avoiding decision making altogether when given the option to do so (Calhoun & Hutchison, 1981). Others have proposed that older adults engage in simplification processes to conserve emotional as well as cognitive processing resources. Leventhal, Leventhal, Schaefer, and Easterling (1993) found that older adults seeking medical care do so more immediately yet request less information when doing so. They proposed that older adults "conserve energy" by seeking medical attention quickly, thus allowing physicians to assume more of the burden of decision making and reducing their own anxiety. Thus, older adults also may reduce the amount of information they seek in order to reduce their emotional investment. Meyer, Russo, and Talbot (1995) also found that older women were more likely to make an immediate decision after hearing one surgeon's recommendation than were younger women, who were willing to risk delaying treatment to hear additional opinions. Taken together, these findings suggest that older adults may choose to conserve energy by avoiding the task of making difficult decisions on their own.

Age-related declines in long-term memory function may also lead older adults to have increased difficulty with retrieving information learned in the past and to have difficulty with *prospective remembering*—retrieving a relevant behavior that one intends to perform at a specific time in the future (see chap. 3, this volume). Recent work has also shown that over time older adults' long-term memory is subject to distortions, such that even when they are able to recall the basic content of information, they may lose details regarding its valence (Skurnik, Yoon, Park, & Schwarz, 2005) or the trustworthiness of its source (Ybarra & Park, 2002). Individuals who are presented with a great amount of information may lose details of information they receive, leading to systematic distortions in the information they recall and leaving them with only a general positive or negative affective impression.

Schwarz and Clore (1996) found that in situations in which older individuals must make complex or speeded decisions, information is often encoded in terms of its emotional value to the individual rather than its actual content. The tendency to base judgments on a positive or negative feeling that one associates with particular options is referred to as an *affect heuristic* (Finucane, Alhakami, Slovic, & Johnson, 2000). Bargh (1996) argued that affective processing occurs automatically. Blanchard-Fields (1998) proposed that this occurs in part because one's emotional state becomes integrated with cognitive representation of events in memory, and she argued that the affective information is available but not necessarily used unless task demands are heightened because of increases in task complexity or time pressure. In some cases, the efficiency of an affective response can be advantageous, as when individuals display heightened sensitivity to information conveyed about risk (Loewenstein, Weber, Hsee, & Welch, 2001), and increases in the ability to use emotional as well as cognitive information observed with age (Labovie-Vief, 1992) can sometimes be important for good decision making (Bechara, Tranel, & Damasio, 2000; Wilson & Schooler, 1991). However, when an affective or emotional assessment of a situation conflicts with one's cognitive assessment of the situation, this might result in older adults' remembering only a negative impression of a treatment—for example, that it was very painful to a friend or relative—and ruling out this treatment despite there being many other factors to recommend it. As another example, the older adult searching for an allergy medication who finds it difficult to keep track of her different options might make her decision on the basis of the relative affective reaction to different side effects or on the memorability of the different options (e.g., resulting from their frequency of appearance in commercials) rather than on their utility to treating her illness. Older adults who have difficulty recalling to-be-remembered information may resort to choosing an alternative that looks familiar (Jacoby, Jennings, & Hay, 1996), elicits positive feelings (Klaczynski & Robinson, 2000), or is consistent with their prior beliefs about quality (Mutter & Pliske, 1994).

Other basic changes in cognitive functions such as working memory also serve as a fundamental component of many higher order cognitive processes, such as reading and comprehension. Specifically, declines in working memory may result in older adults' having difficulty with understanding information that is lengthy or complex (Light & Capps, 1986). In particular, older adults have difficulty revising recently read information, particularly if it is inconsistent with the beliefs they have formed about what they have read (Hamm & Hasher, 1992). Difficulty in revising beliefs that have been formed can be attributed to the increased role that automatic processes play in older adults' thinking (Peters et al., 2000) as well as declines in older adults' ability to inhibit irrelevant information (Hamm & Hasher, 1992).

The addition of time pressure seems to increase difficulty with revising automatically generated inferences; Blanchard-Fields (1998) noted that older adults are capable of revising conclusions automatically drawn from reading a passage of information but only did so when given sufficient time.

Chasseigne, Mullet, and Stewart (1997) demonstrated that this decrease in the ability to perform cognitive "revisions" in older adults also leads to a decreased sensitivity to cue-criterion relationships. The ability to identify a cue-criterion relationship is medically important because it allows individuals to detect a correlation between a situation and an illness or symptom (e.g., being near freshly cut grass and having an allergy attack). Although they found no age differences in older and younger adults' ability to detect simple cue-criterion relationships (i.e., the cue shared a direct relationship with the criterion), the inclusion of an inverse relationship resulted in older adults having significantly more difficulty in accommodating this change. Explicitly stating that the change helped a younger subset of the older group but not the oldest old revised their theories about the relationships. Thus, it is not simply the case that declines in cognitive abilities reduce older adults' sensitivity to probability cues; instead, these declines may make some of the component processes more difficult to execute and may be clearly evident in only the most cognitively demanding situations.

Older adults' difficulty in revising previously held beliefs can also increase their susceptibility to being deceived. A series of studies by Ybarra, Chan, and Park (2001) found that age-related change in cognition may make older adults less capable of being skeptical and socially vigilant when dealing with individuals they have just met. Furthermore, Ybarra and Park (2002) found that older adults were less able to be socially vigilant and to undertake the processes of revising their impressions of people once they were formed. They demonstrated that under cognitively taxing conditions, older adults tended to retain a more positive impression of the individuals who had been discredited since their initial meeting, indicating that they were less able to be cognitively skeptical. These results suggest that older adults may be particularly susceptible to first impressions about drugs and doctors and that they will find it difficult to revise their initial beliefs about a medication they have just learned about if, for example, the medication is recalled or proven to be ineffective.

## Summary

Because age declines in cognition may have a negative impact on older adults' ability to engage in cognitive processes that require effort (Craik & Byrd, 1982), fast responding (Schwarz & Clore, 1996), or filtering out



irrelevant and focusing on relevant information (Hasher & Zacks, 1988), cognitive aging may lead to the suboptimal execution of some or many of the constituent processes of judgment and decision making. This suboptimal execution includes increased reliance on initial affective reactions to a situation, preference for avoiding a decision (or delegating the decision to a physician), decreased ability to remember the original valence of information, deficits in the ability to revise initial inferences generated about information read, and increased susceptibility to being deceived. Furthermore, within distracting contexts such as a noisy drugstore or a busy doctor's office, older adults may be less able to filter out unhelpful or uninformative information, particularly if it is attractive or salient, because of age-related decreases in inhibitory processes (Hasher & Zacks, 1988).

What do laboratory declines on tests of cognition tell us about how older adults make decisions in real life? One possible consequence of aging is that age-related declines in effortful cognition among older adults may lead to their increased reliance on heuristics or cognitive shortcuts to simplify and reduce the cognitive effort of executing decisions (Klaczynski & Robinson, 2000; Mutter & Pliske, 1994). Another is that older adults may adopt alternative information-processing strategies to circumvent these cognitive changes. In this next section, we review some of the research on normative decision making and suggest what this body of research might tell us about how older adults perform on standard decision-making tasks.

## AGING AND NORMATIVE DECISION MAKING

Age-related declines in cognition may affect how and whether normative responses are given on standard tasks of judgment and decision making. Because heuristic use is often conceptualized as a cognitive shortcut that results from the inability to process information exhaustively, older adults, given their cognitive deficits, should be even more likely to use heuristics and, consequently, be more likely to display the biases reported for younger adults (Peters et al., 2000). For example, older adults given the task of choosing between different medications in Table 9.1 may find it difficult to compare two medications that vary on a number of features. Determining how to weigh different traits and how to combine the weights into a composite score representing the utility to the decision maker may be taxing and difficult for older adults. Reductions in working memory capacity might also limit older adults' ability to multitask so that they can consider a new item of information while assessing how it compares with the ones seen previously. Given that a large amount of information will require a number of judgments

and comparisons, it is often necessary to simplify these judgments and decisions.

Automatic processing components of cognition, in part, support older adults' decision-making ability, and older adults can use these intact resources to counteract the effects of aging and support declining cognitive functions. Automatic processes underlie many fundamental aspects of cognition such as heuristic use, stereotype activation, and affective reactions to stimuli (Bargh, 1996). Thus, the use of heuristics is governed by processes that are insensitive to the effects of aging (Peters et al., 2000). Because older adults do not experience the same declines in automatic processes as in effortful processes like working memory and processing speed (Park, 2000), reliance on heuristics that depend on automatic processing should remain stable with age.

The use and overuse of heuristics in simplifying these types of tasks have guided much of the research on normative judgment and decision making. When faced with situations in which people must make a decision in which many conditions are uncertain or unknown, individuals may use heuristics in forming their judgments and decisions. These heuristics can be adaptive (Gigerenzer 1991a, 1991b) and are an important cognitive tool that allow individuals to simplify a complex judgment. For example, doctors often use a similarity heuristic when diagnosing a patient who is exhibiting a host of symptoms. Rather than matching individual symptoms to a mental list of illnesses, physicians may simply assess the similarity of the patient's case to different illness prototypes to make a diagnosis (Elstein, 1999).

However, in some cases, the use of heuristics can lead to errors in reasoning, and the predictable use of a given heuristic in relation to a given type of problem is frequently referred to as a *cognitive bias* (Kahneman & Tversky, 1982). For example, an older adult choosing an allergy medication may be faced with the task of estimating the likelihood of encountering the different side effects associated with each drug. If the older adult is evaluating Drug H versus Drug J, he or she might consider whether it is more likely that he or she will experience headache or nosebleed. Although the package notes might report that nosebleeds have a higher incidence of occurrence (3%) than headaches (1%), the older adult might be unduly influenced by the fact that he or she can imagine having a headache more easily than a nosebleed. In this case, heavier reliance on his or her heuristic might lead the older adult to a suboptimal decision outcome: choosing Drug J. Because the vast majority of research on decision making in younger adults has focused on the inappropriate use of heuristics and the cognitive biases that result, younger adults' decision making provides an excellent framework within which to compare younger and older adults' judgments and decisions (see Kahneman, Slovic, & Tversky, 1982).

## Forming Judgments on the Basis of Mental Availability

A typical result observed with young adults is that the judgments of quantity or likelihood tend to be larger for sets that come to mind easily than they are for less mentally available sets. For example, individuals who are asked to judge whether there are more seven-letter words ending in *-ing* or whose sixth letter is an *n* are typically biased to say that words in the first category are more numerous because it is easier to generate these words mentally. Tversky and Kahneman (1983) theorized that the judgment of set size initiates a mentally effortful task of generating exemplars for the set described and during which the amount of effort expended is used as a metric for estimating the size of the set. By this view, the set of items that comes to mind easily (*-ing* words) is generally estimated (incorrectly) to be larger than the set of items that is more difficult to generate (sixth-letter-*n* words). The underestimation of the size of the logically larger set is evidence that younger adults use an availability heuristic to perform set size judgments.

Within a medical domain, the use of the availability heuristic might lead to older adults' tendency to over- or underestimate their likelihood of becoming ill or of suffering side effects, depending on the relative salience of the illness in question (Peters et al., 2000; Tversky & Kahneman, 1974). Older adults might be disproportionately influenced by the popular discussion of a particular illness's symptoms (e.g., severe acute respiratory illness, or SARS) and overestimate their risk for becoming infected with the disease. If this question were posed in 2003, with the increased media attention given to SARS and the relative reduction in salience of influenza, this might lead older adults to (incorrectly) respond that they are at greater risk of catching SARS than the flu. In this case, the vividness of the SARS symptoms and their resulting heightened mental availability would likely inflate estimates of likelihood for being affected by the disease despite its low incidence in the population relative to a more immediate concern for elderly adults such as the flu (Centers for Disease Control and Prevention, 2003).

### Order Effects on Memory

A perfect model of normative decision making would predict that individuals presented with the same pieces of information should produce the same judgment or decision regardless of the order in which the information is given. However, Chapman, Bergus, and Elstein (1996) found that the order in which multiple pieces of information was presented affected the eventual decision that was made. Both novice and experienced physicians read three pieces of information sequentially from a patient file indicating the following:

1. The patient had a history of lung cancer.
2. The patient exhibited a neurological disturbance.
3. The patient's computed tomography (CT) scan was normal.

Physicians were asked to estimate the probabilities of the following two diagnoses: (a) that the patient had had a transient ischemic attack (a stroke) and (b) that the patient had a brain tumor. In the absence of all other information, a past diagnosis of lung cancer would be suggestive of a brain tumor. A normal CT scan would be evidence against the presence of a brain tumor. Half of the physicians in the study read the patient information in the order described above (i.e., 1-2-3), and the other half read it in the reverse order (i.e., 3-2-1). Chapman et al. found a significant asymmetry in decisions made as a function of presentation order. Specifically, they found a recency effect in which physicians who received information about the previous diagnosis of lung cancer last (in the third position in the series) were significantly more likely to give a diagnosis of a brain tumor compared with physicians who received this information first in the series. This effect of recency was found regardless of physicians' level of experience. Among older patients, recency effects might lead them to choose later presented treatments disproportionately often, especially in cases in which options are presented orally rather than in a written format, as is common in a doctor's office. Indeed, in a study of older adults' choices of response options in telephone surveys, Schwarz and Knäuper (2000) found that the tendency to endorse the last response option presented orally in a series tended to occur with greater frequency among older interviewees.

What can be done to remedy recency effects? Chapman et al. (1996) suggested that one way to "debias" physicians would be to encourage physicians to consider clinical evidence in different orders and to review the most relevant information immediately before making a diagnosis to increase its weight. Older patients might be provided with a summary at the end of their appointment in which the treatment options are presented in a different order than was presented verbally by the physician, and additional care could be exercised to present lists of treatment options in both an auditory and a written format. Recent follow-up work supports the efficacy of these strategies, suggesting that recency effect can be remedied by initiating a process of self-review in which the decision maker completes an ongoing comparison between his or her decision and the original goal (Ashton & Kennedy, 2002). Thus, individuals can be encouraged to "stay on track" and not be disproportionately influenced by the last piece of information encountered. Although the research on order effects has largely focused on younger adults, age-related changes that are typically observed in information-processing behavior suggest that susceptibility to order effects may be magnified with age. Webster, Richter, and Kruglanski (1996) demon-

strated that mental fatigue induces inefficiencies in processing and increases primacy effects in information use in decision making. To the extent that particularly demanding tasks in which there are multiple options and multiple features to be compared are particularly taxing for older adults, this may induce similar levels of fatigue and increase older adults' susceptibility to these types of order effect.

### **Judgments Based on Representativeness or Similarity**

When individuals are asked to judge the probability of an event, such as the likelihood that they have breast cancer, they tend to use a shortcut in which they evaluate the similarity between the event and some prototypical event and use similarity to estimate the probability that the event will occur. In this situation, if the individual in question is very similar to the stereotype they hold for a typical breast cancer patient, they will produce higher estimates of likelihood than if there is a low level of similarity. This use of the representativeness heuristic (Tversky & Kahneman, 1983) allows individuals who are uncertain about how to judge the probability of populations to make this judgment on the basis of an easier judgment of similarity. Thus, the use of this heuristic would produce a predictable pattern of results in which a female would judge herself to have a high probability of having breast cancer, whereas a male would be less likely to produce a self-diagnosis of having the disease. Although in this situation the heuristic produces an estimate that is consistent with the relative risk for the disease, when more salient or memorable options exert greater influence in the judgment than less salient, but perhaps more important, information, this can lead to inappropriate probability judgments. For example, an individual who is short of breath may perceive high similarity between the present symptom and a heart attack, inflating the perceived probability judgment that he or she is experiencing a heart attack and leading, perhaps, to an unnecessary trip to the emergency room. Because older adults are more prone to rely on stereotypes in situations with greater degrees of uncertainty (Mather, Johnson, & DeLeonardis, 1999), this would lead to increases in using representativeness as a metric for probability and an accompanying increase in these kinds of medical errors.

Fortunately, whether individuals display a representativeness bias depends to a great extent on the salience or strength of the stereotype. For example, if the individual feels strongly that being female is a critical feature of the typical breast cancer patient, then a male patient will perceive his risk for this disease as being very small. However, if a patient vignette is worded in neutral language, to avoid eliciting stereotypes that can be embraced or discounted, this may decrease individuals' display of the representativeness bias. On the other hand, if the objective is to warn a patient that

his or her risky behavior is likely to lead to an illness, highlighting the high degree of similarity between their own case and a patient vignette may be desirable. Tymchuk, Ouslander, Rahbar, and Fitten (1988) found that the use of storybook vignettes was effective in improving patients' comprehension of medical procedures, possibly because the introduction of a character highlighted the similarities between the individual receiving the procedure in the story and the individual about to undergo the procedure. Thus, the perceived distance between the patient and a prototypical patient may be an important metric for how the patient assesses risks associated with illness or various medical procedures.

### **Violation of the Conjunction Rule**

Patients embarking on medical treatments may also be asked to estimate and compare the relative magnitude of two probabilities. For example, in making a decision about his or her chance of having a heart attack, a patient may be asked whether there are more individuals who have had one or more heart attacks or individuals who are over the age of 55 and have had one or more heart attacks (Kahneman et al., 1982). Younger adults typically estimate the latter to be greater, with the explanation being that having multiple heart attacks is consistent with many people's stereotypes of elderly adults. Thus, for an individual to be both over the age of 55 and prone to heart attacks is especially consistent with their stereotype and, invoking the representativeness heuristic (Kahneman & Tversky, 1982), college-age participants wrongly estimate that the size of the group representing the conjunction of the two events would be larger than the size of the group defined by the single criterion. It follows from the literature on age-related cognitive declines that older adults might have difficulty overriding the automatically generated response that is consistent with their stereotype of older adults.

### **Anchoring and Adjustment**

In judgments requiring an estimation of quantity or likelihood, a typical heuristic is to generate an initial estimate based on subjective evidence and then revise that estimate on the basis of incoming information. This heuristic is adaptive if the initial estimate is accurate, but frequently it results in inaccurate judgments when the estimate is not revised sufficiently to reflect new evidence (i.e., a primary effect). This may be problematic for older adults, who experience decreases in cognitive flexibility and may have particular difficulty revising their theories or estimates once they have made them mentally. Taken with evidence suggesting that older adults in some cases display more risk-averse tendencies compared with younger adults (Dror,

Katona, & Mungur, 1998), it may be the case that older adults allow their predispositions (low-risk seeking) to guide their initial estimates or decisions and that any revisions of these estimates that occur subsequently will be insufficiently small or will not occur at all.

## Summary

Older adults typically experience a variety of cognitive declines such that making decisions may force them to rely more heavily on heuristics that allow them to simplify decisions at hand and reduce cognitive effort. Like young adults, older adults may find it difficult to judge the relative likelihood of occurrence of two outcomes (e.g., likelihood of two different side effects) and use the relative mental ease or availability of the two side effects to judge which is more likely to occur. Decreases in working memory capacity and processing speed might also hinder older adults' ability to process multiple alternatives when making a decision and lead them to place disproportionate weight on the first or last options they hear. Finally, older adults may find it especially difficult to revise inferences that they have already generated about an illness or a diagnosis. These stereotypic patterns of cognitive bias are found reliably when younger adults are presented with these decision-making scenarios, and age-related changes in cognitive function may lead older adults to make similar or even more biased judgments and decisions. However, increases in cognitive bias may not present a complete picture of older adults' performance of decision making in everyday contexts. In the next section, we present evidence that although this standard framework for evaluating decision-making outcomes on the basis of their normative value captures judgment and decision making within specific tasks, it does not provide a way to assess the constituent processes of decision making in which older adults demonstrate an ability to compensate for these changes in age-related cognitive function.

## STRATEGY USE AND EVERYDAY DECISION MAKING

A recent surge of interest in everyday decision-making processes has led to a shift in focus away from regarding decision making as a purely probabilistic task in which there is a clear, normatively defined correct response. Classic research on decision making (Kahneman et al., 1982) is characterized by two central issues: (a) the establishment of a normative yardstick against which judgment and decision behavior are measured and (b) a focus on the product of judgment and decision processes as typically measured by college-aged adults' responses to a standard set of tasks. Defined in this way, normative responding on classic judgment and decision-making

tasks (Kahneman & Tversky, 2000; Tversky & Kahneman, 1974) entails responding in a way that is consistent with Bayesian probabilities and that adheres to axioms of rationality such as expected utility theory (Sen, 1971; Von Neumann & Morgenstern, 1947). Normative responding might include making judgments and estimations of magnitude or quantity that reflect base-rate probabilities, choosing consistently (as opposed to inconsistently) among a set of alternatives (Simonson & Tversky, 1992), accurately weighing multiple pieces of information based on informative value, and ranking the likelihood of various outcomes in a way that is consistent with background information (Yates & Patalano, 1999).

However, recent work suggests that a normative yardstick may not provide a complete means for evaluating the quality of everyday decision-making behaviors. Huber, Wider, and Huber (1997) found that individuals presented with naturalistic decision-making tasks, in which they actively collected information to reach a decision, rarely sought or used exact probability information to assess the relative risk presented by different alternatives and to choose a course of action. They suggested that naturalistic decision making in a context that involves risk may not induce the same pattern of heuristic use and cognitive biases traditionally exhibited when a decision is presented as a gamble, possibly because gambles involve the presentation of relevant information up front, whereas naturalistic decisions require the decision maker to search and acquire information and determine its relevance before making the decision. Among the types of naturalistic decisions included here are the types of behavior that are required when evaluating options in medical, financial, and legal settings as well as more traditional settings that involve the purchasing of goods and services.

### **Ruling-Out Strategy**

M. M. S. Johnson (1990) presented older adults with a car-purchasing task in which the participants were asked to choose which of six cars they would purchase. Each car's description consisted of its performance on nine different criteria, such as fuel economy, riding comfort, and maintenance cost. At any given time, participants could press a key allowing them to view a single piece of information about a single car, and participants guided their own information searches by selecting which cars they wished to evaluate and what types of information they chose to view. Participants were under no time constraints and were allowed to view as many pieces of information about as many cars as they wished.

M. M. S. Johnson (1990) found that older adults making a decision to buy a car tended to seek out less information and to spend less time reviewing each option compared with younger adults. Although this processing difference would initially seem to be maladaptive, M. M. S. Johnson



and Drungle (2000) provided evidence that this abbreviated search behavior may be indicative of higher quality of search behavior: They found that older adults choosing between over-the-counter medications demonstrated more organized patterns of search. Sanfey and Hastie (2000) characterized these abbreviated types of search strategies as noncompensatory strategies—using a set of minimal criteria to rule out options found to be unacceptable in order to reduce the number of options that must be considered. This strategy of ruling out eliminates decision options with certain features and does not allow them to enter the comparison process at all. It is contrasted with compensatory strategies, which require more effort and in which the pros offset the cons of an individual option but in which all options are weighed and taken into consideration to make some options seem better than others. It is also evidenced in older adults' decisions made about medical options. When making decisions in which they are choosing between multiple medical options, Meyer et al. (1995) found that older patients seek out less information, suggesting that they self-regulate the amount of information they will have to consider in making a decision, and that they require less time to reach their decisions. Zwahr, Park, and Shifren (1999) found that older women considering estrogen replacement therapy made fewer comparisons of treatment alternatives and perceived that they had fewer options.

Several factors are thought to increase noncompensatory decision making, including increased decision complexity (J. E. V. Johnson & Bruce, 1997) and reductions in time given to make a decision (Maule, Hockey, & Bdzola, 2000). To the extent that increased processing demands resemble age-related declines in cognitive function, declines in processing abilities with age may lead to an increase in older adults' engagement of noncompensatory styles of decision making. Thus, an elimination strategy reduces the amount of information that must be considered and may thus be a particularly useful strategy for older adults, and older adults appear to engage in information collection strategies that successfully compensate for their cognitive declines.

## Summary

Normative decision-making tasks may not provide a complete means for evaluating the quality of everyday decision-making behaviors. Process-oriented models of decision making (M. M. S. Johnson, 1990; Payne, 1979) have demonstrated that older adults adapt their acquisition of information in ways that compensate for their declining ability to engage in the simultaneous processing of multiple pieces of information and consider fewer options because of their slower ability to process this information. Thus, an inspection of older adults' processing strategies provides insight into what might be the most effective way to support older adults' decision-making performance.

## ASPECTS OF DECISION MAKING PRESERVED WITH AGE

Age-related declines in cognition notwithstanding, much of the research on aging and decision making has demonstrated that the quality or outcome of older adults' decisions is comparable to that of younger adults. For example, although older adults consider less information and make their decisions more quickly, younger and older adults typically arrive at the same decisions (Meyer et al., 1995; Zwahr et al., 1999). Meyer et al. (1995) found no age differences in final treatment selection among younger and older women presented with information about treatments for breast cancer. Using a financial decision-making task, Hershey and Wilson (1997) found no evidence to support the supposition that older adults exhibited more overconfidence or were otherwise maladaptively biased in their decisions. In the previous section, we reviewed evidence suggesting that older adults frequently use strategies to adapt tasks in ways that accommodate age-related reductions in their processing resources. In this section, we illustrate how age-related changes in cognition can also support the continued ability of older adults to make competent decisions in a variety of domains and suggest how these competencies can be developed into strategies for facilitating medical compliance in older adults.

The preservation of competent decision-making ability is demonstrated pragmatically as well as empirically through research demonstrating that the performance of molar decision-making behaviors, such as workplace and managerial behaviors (Park, 1994; Taylor, 1975), remain at high levels with age. Similarly, expertise in specific domains such as chess playing does not appear to decline with age (Charness, 1981). Thus, older adults appear to maintain high levels of decision-making ability through a combination of compensatory strategies and accommodation of tasks to fit their cognitive deficits (Salthouse, 1987). In fact, some recent work has provided evidence that older adults' greater experience in making decisions may even remediate tendencies to "irrational" decision making that have been reliably documented in younger adults. Tentori, Osherson, Hasher, and May (2001) showed that a consumer decision elicited a pattern of irregular choice making in younger adults but not in older adults. Specifically, they demonstrated that after groups of younger and older adults stated which of two options they preferred, younger adults showed a greater tendency than older adults to reverse that preference when an irrelevant, third option was presented. This preference reversal violates a standard axiom called *regularity*, because the addition of the third option is irrelevant and therefore should not influence the decision in any way. Thus, although numerous declines in cognition and processing speed occur as individuals age, these declines do not necessarily signify declines in judgment or decision-making skills.

A number of explanations have been proposed to account for stability in decision-making ability across the life span. First, the fact that older adults often remain capable of executing critical activities in their daily life despite demonstrated deficits in laboratory tests of memory suggests that laboratory testing conditions may not be comparable to demands encountered by older adults in everyday life. This may be because skills that appear superficially similar in the laboratory may not show similar patterns of age-related decline in real life. Salthouse (1984) illustrated that although both laboratory reaction time tasks and typing tasks in which individuals read and typed texts engage superficially similar motor skills, only the reaction time tasks evidenced the typical pattern of age-related slowing that is attributed to general slowing of processing speed. Thus, seemingly similar tasks may not exhibit similar age differences in performance.

Cognitive declines also can be offset or masked by compensating mechanisms such as practice or experience. Salthouse and Somberg (1982) showed that older adults improved with practice at performing a task requiring them to verify whether an item currently being presented was present in a set of items seen earlier, with the set size of items varying from one to four. The improvement, however, did not manifest itself as a reduction in the gross age difference in mean reaction time collapsed across set size. On the contrary, older adults remained on the whole slower than younger adults. However, measures of the slope of the relationship between the reaction time as the set size of items presented increased showed an important age difference. With practice, this slope measure was greatly reduced in older adults such that the initial large age difference between older and younger adults virtually disappeared after 50 sessions of practice. The reduction in slope was typically interpreted as reflecting older adults' improvement through practice in making the comparison between the probe stimulus and the previously viewed objects. With practice, the comparison with one item versus multiple comparisons with four items became easier. The explanation is that memory scanning becomes more automatic with practice; thus, the attenuation of the age difference in slope can be attributed to the fact that the automatization of the memory comparison process is developed equally easily by younger and older adults. Older adults can catch up to the performance levels of younger adults through practice.

Older adults also may compensate for age-related deficits on some processes by masking these deficits with gains in performance on other processes. Charness (1981) demonstrated that older chess players whose memory deficits were evidenced in poorer accuracy for configurations of pieces also considered fewer alternatives when selecting moves in a game. Older and younger players were equally skilled in the molar behavior of playing the game of chess, however, which suggests that the observed reductions and abbreviations in a subset of the component behaviors were offset

by gains in other areas, such as possibly faster searches among available alternatives and faster identification.

Finally, older adults may also be able to support declining cognitive functions by relying on cognitive functions that are relatively resistant to the effects of aging. Park et al. (2002) noted that measures of world knowledge, such as verbal fluency, remain intact and even show slight improvements as individuals age. Similarly, Salthouse (1996) found that older adults showed little evidence for decline on measures of crystallized knowledge, such as measures of vocabulary. Meyer et al. (1995) suggested that increases in reading ability, specifically, may support older adults' ability to make faster decisions compared with younger adults, because they identify critical information more quickly and remember it later when making their decision. In addition to increases in specific cognitive abilities (e.g., verbal ability), older adults' automatic processes are also relatively spared from the effects of aging (Park et al., 2002). Thus, older adults' competencies in decision making may also receive support from abilities that remain preserved with age.

In addition to supporting older adults' performance of everyday activities, automatic processes can be trained to close gaps in performance that arise from age-related declines in cognition. The success of older adults' automatic processes in compensating for cognitive deficits is best evidenced in work on medical compliance. With regard to practical medical behaviors, older adults who have been treated for a number of years for high blood pressure are in fact more adherent to medications than are middle-aged adults (Morrell, Park, Kidder, & Martin, 1997; Park et al., 1999). This is surprising, given that medication adherence is a cognitively demanding task. However, although older adults do show declines in the ability to perform self-initiated processing, their highly routinized schedules allow them to be in familiar contexts frequently, which provides the environmental support for a regularly occurring activity such as the taking of medications. When a pattern of behavior is repeated over time, such as taking medication with breakfast, it becomes automatized and takes on features of an automatic, well-learned behavior such as driving a car with a standard transmission or riding a bicycle.

Other laboratory research supports the effectiveness of using mental rehearsal to recruit automatic processes that support medical and health behaviors. Mental rehearsal has proved effective in promoting a range of health behaviors from performing monthly breast self-exams (Orbell, Hodgkins, & Sheeran, 1997) to maintaining a healthy diet (Verplanken & Faes, 1999; for a review, see Gollwitzer, 1999). Perhaps even more surprising is that older adults are capable of extending strategies that tap into automatic processes in service of maintaining high levels of medical adherence on new medical behaviors, including those that are complex and challenging.

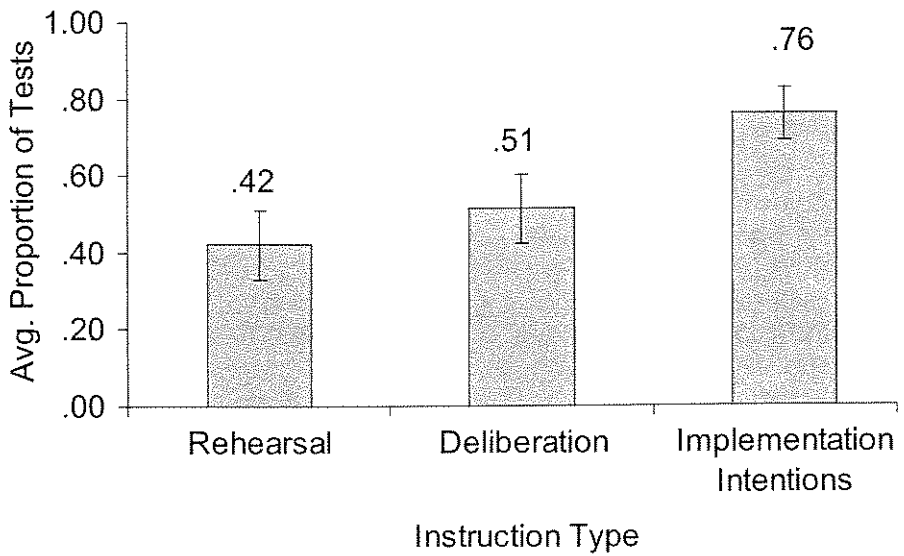


Figure 9.1. Proportion of blood glucose tests performed within 10 minutes of the target times as a function of instruction group. Error bars represent  $\pm$  standard error of the mean. Rehearsal = repeating instructions out loud; deliberation = generating pros and cons; implementation intentions = forming specific plans; avg. = average. From "Aging and Medical Adherence: The Use of Automatic Processes to Achieve Effortful Things," by L. L. Liu and D. C. Park, 2004, *Psychology and Aging*, 19, p. 321. Copyright 2004 by the American Psychological Association.

Liu and Park (2004) demonstrated that older adults taught a strategy for a prospective memory task of remembering to perform a new medical behavior—the performance of blood glucose testing four times daily for a 3-week period—were highly successful at remembering to perform their tests (Figure 9.1). These results are consistent with research that has performed direct comparisons of effortful and automatic retrieval from memory, which generally has shown large differences in performance between older and younger adults for when retrieval requires effort but small or no differences when memory retrieval is automatic.

In summary, cognitive declines can be offset or masked by compensating mechanisms such as experience or practice and if only normative behavior is examined—that is, assessing only right and wrong answers. This may present an overly pessimistic view of decision making in aging individuals. Thus, the process of aging distinguishes between tasks requiring the active engagement of processing resources (processing declines) and tasks serving a maintenance function, such as those that are well rehearsed and that do not require as many new decisions to be made (Murphy, 1989).

Older adults may use practice to remediate the effects of aging, develop alternative strategies to accommodate these deficits, or use their combined

years of experience in solving other types of problems to mask these deficits. Through the use of noncompensatory decision strategies and attempts to focus their efforts on only decision options most likely to be favorable, older adults' performance of molar decision-making behaviors can remain at high levels. Age-invariant cognitive functions such as verbal and reading ability and automatic processing capabilities are also important supports for decision making in older adults. Automatic processes, in particular, are important because they can support declines in other types of processing. Thus, an understanding of the competencies in older adults' decision-making ability not only sheds light on why there are processing differences between younger and older adults' decision making (e.g., why older adults consider fewer options) but also suggests ways in which medical judgment and decision making can best be supported.

### PRESCRIPTIVES FOR PRESENTING MEDICAL DECISIONS TO OLDER ADULTS

Approaches to improving older adults' judgment and decision-making skills that focus solely on compensating for age-related deficits without taking into account preserved aspects of cognitive function may overlook the fact that older adults frequently make good decisions despite approaching decision-making tasks in fundamentally different ways than younger adults. Peters et al. (2000) suggested that an overly pessimistic view of decision making in old age also may be harmful in that it may induce biased decisions about whether older adults are competent to give or refuse consent to medical care. Furthermore, it is also important to be mindful that older adults' decision-making strategies are not simply pared-down versions of younger adults' approaches. With these caveats in mind, we conclude with a discussion of ways in which judgments and decisions might be structured to take advantage of the processes that continue to function well in older adults and to improve older adults' compliance with medical instructions.

#### **Highlight General Principles That Relate Similar Decisions**

Decision-making ability does not appear simply to decline over the life span. Rather, older adults may approach decision making using strategies or general rules that they have learned by experience (Baltes & Staudinger, 1993). Thus, practitioners who design decision-making aids for older adults should not focus exclusively on compensating for age-related deficits in cognition (e.g., presenting information more slowly or reducing the number of options presented). Rather, interventions should also consider that older adults have experience in making a variety of judgments and decisions and

should highlight general principles (e.g., basic rules of set theory) that may be useful in guiding decisions across multiple contexts. For example, an older adult who is considering getting a smallpox vaccine instead of a flu vaccine might be encouraged to place less emphasis on what is being reported in the media and be reminded of the relative risks presented by both illnesses. Although there may be a tendency to process the risks heuristically and to inflate the likelihood of becoming infected with the illness that is more salient at the moment, this tendency can be corrected by highlighting the parallels with past decisions in which inflated risks of contracting a more "famous" but statistically less common illness was adjusted (e.g., choosing between getting tested for anthrax and getting tested for high blood pressure or diabetes).

### **Highlight Differences Between Critical and Noncritical Information**

Although it is logical to assume that older adults' reductions in processing capacity would suggest a preference for less information, it is more often the case that older adults prefer more rather than less information (Beisecker & Beisecker, 1990). However, differentiating more from less important information is as crucial as regulating the total amount of information given, because increasing the amount of information available is not guaranteed to produce the same effects on all patients. For example, Deyo (2001) investigated the medical decisions made among patients with back problems, comparing those who received a written booklet of treatment options and those who received both a videodisk and a booklet. Patients included those who suffered from a herniated disk and those who suffered from spinal stenosis (a compression of the spaces in the spine that leads to pressure on the spinal cord or nerves, often resulting in pain or numbness in the legs). Deyo found that although the inclusion of the videodisk resulted in a 22% lower surgery rate among the patients with herniated disk, it produced a higher rate of surgery among the patients with spinal stenosis. It is important to note, however, that among the two information groups there were no significant effects in any of the outcome measures, such as measures of pain.

On closer examination, the differential effect of the videodisk is apparent. The symptoms resulting from a herniated disk are characterized by gradual recovery without treatment. The effects of spinal stenosis, however, tend to remain constant and rarely improve without surgery. Hence, the videodisk essentially improved decision making merely by highlighting the most important information for making the decision, although this resulted in different decisions being made by both groups. The end result was favorable from a practitioner's point of view: All patients achieved equally positive outcomes, with a 22% lower surgery rate among one of the groups. This

indicates that the optimal decision was made both by individuals who elected to have and by those who elected not to have the surgery (Deyo, 2001).

### Counterbalance Order of Information

Although older adults are experienced at making many types of decisions, given the cognitive declines that may stand in the way of older adults' ability to consider all alternatives exhaustively, physicians and health care providers presenting older adults with multiple medical alternatives should consider whether information is consistently being presented in the same order and consequently whether one alternative is being given excessive consideration. It appears that even experienced decision makers are prone to being unduly influenced by the last piece of information presented in a series. Thus, care should be taken to present the most important information first or last rather than embedding it in the middle of other information. Furthermore, encouraging patients to engage in self-review in which they continually compare their decisions with their original goal may prevent patients from being overwhelmed by a large amount of intervening information. For example, a patient who is surveying the options in Table 9.1 may proceed through the first five drugs listed (Drugs A–D) and become focused on choosing between traditional oral medications (tablets) without allowing him- or herself to consider either the nasal sprays or the chewable or dissolving medications. Encouraging patients to prioritize their needs (e.g., ease of administration) and to continually evaluate each medication option against these needs may help patients to stay on track and consider a wider range of options rather than being unduly influenced by the first or last medications seen.

### Present Valence of Information Positively

Older adults' increased gullibility and increased sensitivity to the "illusion of truth" under conditions of cognitive load suggest that older adults can be misled easily (Skurnik et al., 2005). If older adults are frequent visitors to a particular Web site and are exposed repeatedly to false information, of particular concern is that repeatedly warning older adults that a piece of information is false will "backfire" and that over time this information will gain an illusion of truth. Older adults also may experience some cognitive stress when using new technologies on the Internet or when learning about new technologies from a doctor or a salesperson. In particular, those who interact with older adults should be advised to phrase their directives in terms of positives rather than warning against negative results (e.g., "Take this medication with food" rather than "Don't take this medication on an



empty stomach”). Furthermore, older adults should be warned against making quick judgments when they encounter salespeople or vendors on the Web.

### **Be Sensitive to Numerical Presentation**

Given the research reporting that equivalent numerical representations of probabilities, such as percentages and proportions, are not regarded as equivalent by individuals, it is important for physicians to be sensitive to this difference in perception. Specifically, because frequency representations of probability (a 1 in 10 chance) elicit more of an affective reaction than percentage representations (a 10% chance), physicians and other health care providers should consider presenting statistics on long-term survival or mortality rates as percentages to minimize alarm. In contrast, they may wish to present risks associated with unhealthy behaviors such as smoking or failing to monitor blood glucose levels as frequencies (i.e., a 1 in 10 risk vs. a 10% risk) to emphasize patients’ personal vulnerability to the ill effects of these behaviors.

### **Use a “Forced-Choice” Format When Prescribing Health Behaviors**

Older adults given the opportunity to defer making a choice will often do so (Calhoun & Hutchison, 1981). Thus, if a physician or health care provider is seeking to institute a healthy behavior into a patient’s schedule, he or she may be more successful by offering Option A (adding one vegetable to the diet everyday) or Option B (taking a 15-minute walk everyday) rather than suggesting one option or the other alone. In the latter case, the choice is either “choose A or do nothing” or “choose B or do nothing.” Presenting the choice as “choose A or B,” however, may increase the chance that at least one of the two desirable behaviors will be performed.

### **Increase Rehearsal and Practice in Making Decisions**

With an increasing number of elderly becoming familiar with the Internet, we suggest that another means to improving medication adherence is simply to encourage older adults to practice the act of making decisions. Honing the automatic component of the process may be especially useful. For example, when older adults are presented with a new set of choices, they may form the following implementation intention to read instructions slowly and carefully: “When my doctor presents me with more than one option, I will stop and read each option out loud slowly and carefully.” This may encourage older adults to engage in more deliberative processing and override initial automatic affective feelings or prejudices.

Using the Internet, older adults can also read a variety of health reports about different medical technologies and procedures so that they become accustomed to weighing different information sources and making decisions about their own care. Older adults may have considerably less experience than do younger adults in being active consumers of different types of medical information (Petrissek, Laliberte, Allen, & Mor, 1997). They may also be unaccustomed to having multiple choices and may have less practice in weighing different features to reach a decision. The widespread availability of medical information on the Internet may be an important resource in helping older adults to practice processing information and drawing conclusions from what they have read (Liu & Park, 2003). For example, rather than simply being told to take their medications, older adults can read about drug interactions to learn why some drugs must be taken on an empty stomach and others must be taken with food. In particular, information on the Internet may be especially helpful in highlighting contraindications for certain medicines. A warning sticker on a medication vial may include a brief warning to "avoid sunlight while taking this medication," but additional elaboration of these warnings on the Internet may include a more detailed explanation for why the medication increases the skin's sensitivity to sunlight and could include pictures detailing what can occur if precautions are not taken, both of which can improve an individual's memory for the warning.

## CONCLUSIONS

Although the cognitive declines that accompany aging are well documented (Park et al., 1996, 2002), acknowledging that these declines are accompanied by improvements in other cognitive functions provides an important piece of the puzzle of identifying the types of judgments and decisions that are likely to be most problematic for older adults. We have argued in this chapter that decision-making ability does not simply decline over the life span. Although numerous declines in cognition and processing speed occur as individuals age, the preservation of well-practiced, automatic behaviors may explain the classic paradox of cognitive aging that older adults continue to make reasonably good decisions in many domains despite experiencing age-related decline. This perspective has important implications for designing interventions, because it suggests that practitioners who design decision-making aids for older adults should not focus exclusively on compensating for age-related cognitive deficits (e.g., presenting information more slowly or reducing the number of options presented). Rather, interventions should also consider older adults' experience with making a variety of judgments and decisions and highlight general principles that may be useful in guiding decisions across multiple contexts with problems that share

a common structure. For example, older adults asked to decide between a generic or full-cost prescription drug could be unduly lured by the widespread brand recognition of the full-cost drug. However, an intervention that encourages them to resist their initial impressions and to take time to review their options could encourage them to think about the common list of active ingredients in both drugs and the similar effects each will have on their health. This decision strategy of waiting and then weighing and prioritizing the features of two different options could then be transferred to other decision contexts. Understanding how different judgments and decisions are more and less sensitive to age-related cognitive decline may help to highlight the best ways in which to present them to older adults and may suggest ways to optimize decision-making efficiency to minimize the negative effects of aging in important situations.

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# IV

## TECHNOLOGY AND TREATMENT