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HOW MUCH INFORMATION DO MEN REALLY WANT?

INFORMATION SEARCH BEHAVIOR AND DECISION RATIONALE

IN A MEDICAL DECISION-MAKING TASK FOR MEN

A Thesis in

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ABSTRACT

The relationships between age, prior knowledge, working memory resources, vocabulary, and control preference in medical decision-making, information search behavior, and decision rationale are examined in a sample of 117 men across the adult lifespan (ages 20 to 87). Participants worked through a hypothetical, web-based prostate cancer treatment decision which unfolded as they proceeded through various stages of the decision process. Individual correlations indicated that age, working memory resources, vocabulary, and control preference significantly predicted the amount of information men sought during the decision. The hypotheses that age effects on information search behavior and decision quality would be fully mediated by vocabulary, working memory, control preference, and prior knowledge were not supported. When these variables were considered simultaneously, age and vocabulary were the only significant predictors of information search. This indicated that younger men and those with greater vocabulary sought more information on which to base a treatment decision. Decision quality, was predicted by age, working memory, prior knowledge, and the amount of information men sought during the decision task. Men who were younger, had more working memory resources, more prior knowledge, and who invested in greater amounts of information search produced decision rationales which considered more pieces of information and contained more comparisons between ideas. Age directly and indirectly affected differences in quality of decision rationale. These indirect effects resulted through age-related changes in working memory, prior knowledge, and information search.

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INTRODUCTION

Over the past three decades the meaning of informed consent has changed. At one point it was taken to mean that physicians would tell the patient what they thought the patient should know. This paternalistic approach to medicine, however, has in large part been replaced with a focus on shared decision-making (Towle & Godolphin, 1999). The process of shared decision-making involves a commitment by both physician and patient to work together to generate and execute medical interventions which meet the needs of all involved. Shared decision-making puts more emphasis on patients' roles in understanding their medical situations and expressing their desires regarding how they would like to be treated. Several studies have focused on the degree to which physicians provide patients with sufficient information to make them comfortable with their treatment (Barry, 1999; Kunkel, Myers, & Lartey, 2000).

Unfortunately, not all patients are ready for this heightened decision-making role. Medical decision-making is a complex task. In order to effectively select a treatment option, patients must consider a number of factors. Appelbaum and Grisso (1988) characterize the task as involving a need to store and understand information about the various treatment options, including their likely outcomes, risks, benefits, and the probabilities for all three. Patients must be aware of their personal preference for the potential results of the various options in light of their treatment goals and particular life circumstances. In addition, they must be able to reason through the integration of this information to determine their best options. All of this occurs while patients may be emotionally traumatized by the diagnosis.

The requirements of informed consent coupled with a heightened push toward shared decision-making have increased the pressures on patients to take responsibility for their health care. Numerous patient education programs have been initiated in an effort to better equip adults across the lifespan to be involved in health decisions (Davison & Degner, 1997; Derdiarian, 1995; O'Roarke, 2001; Stacey et al., 2001). These programs often focus on the use of various media and interactions to increase patients' awareness of issues surrounding their health situations. However, it is important to note that individual differences among patients may make blanket education approaches unwise.

Too much information, especially if it is conflicting (Bar-Tal, 1994; Steptoe, Sutcliffe, Allen, & Coombes, 1991), can cause increased anxiety within patients. Anderson and her colleagues (Andersen, 2001; Andersen, Kiecolt-Glaser, & Glaser, 1994) have described in their biobehavioral model of health how patients' stress and quality of life concerns play a major role in the physiological processes related to disease control. They noted decreases in the body's ability to fight off disease as anxiety increases. It is, therefore, important to determine how likely patients are to want information. When this can be anticipated, a patient education program can be implemented to meet the needs of the individual patient. A simplistic approach to patient education in which physicians give all patients a host of information, expecting them to process it in such a way as to decide what they might prefer to do, is not appropriate. Rather, physicians need to recognize how they may provide interventions that facilitate healthy levels of involvement.

To this end, research has been conducted to determine variables associated with the process of gathering information. Age has immerged as a prevalent indicator of

information search in both medical decision tasks (Meyer, Russo, & Talbot, 1995; Pierce, 1993; Turk-Charles, Meyerowitz, & Gatz, 1997) and non-medical decision tasks (Johnson, 1990; 1993; Sinnott, 1989; Streufert, Pogash, Piasecki, & Post, 1990). As individuals get older, they tend to seek out less information prior to making a decision. Sinnott (1989) characterized decision makers as falling into one of three groups: young, mature, and old. Each increasing age-related group was said to rely less on information gathering than the age group before it.

While this decrease in information search is clear, it is not clear what mechanisms age utilizes to bring about such an effect. Potential individual differences found to be related to age and information search include patients' information processing resources (such as working memory capacity; Park, 1999; Zwahr, Park, & Shifrin, 1999), verbal ability (Meyer et al., 1995; Zwahr et al., 1999), prior knowledge (Devine and Kozlowski, 1995; Johnson, Meischke, Grau, and Johnson, 1992; Meyer et al., 1995), and the patient's desire to be an active participant in the decision-making process (Deber, Kraetschmer, & Irvine, 1996; Degner and Sloan, 1992; Wong et al., 2000).

Other research (e.g. Andersen, 2001; Lockenhoff & Carstensen, 2004) have focused on how emotion regulation influences health-related information search behavior. Lockenhoff and Carstensen have developed a socioemotional theory of decision-making in which older adults are believed to modify their information-processing approaches in order to regulate their own emotional responses to the situation. While this line of research has yielded insight into the importance of emotional responses in serious health conditions, the present study is geared toward an investigation of the cognitive components of medical decision-making. This concentration is due, in large

part, to a desire to determine if these components, alone, can account for extant age-related difference in medical decision-making (Zwahr et al., 1999).

The main purpose of this research is to investigate the manner in which age affects information search through changes in preference for control, vocabulary, prior knowledge, and working memory. In addition, the study will investigate how these interrelationships affect the decision-makers' ability to produce rationales in support of their decisions. This study examines age, information search, and rationale quality of a sample of men as they work with an unfolding, decision-making scenario about prostate cancer.

LITERATURE REVIEW

A major focus in this dissertation is the relationship between age and information search. First, the literature on this relationship will be reviewed. Next, individual difference characteristics, which have been shown to related to both age and information search behavior, are reviewed. While discussing each characteristic, there will be a review of the literature connecting it to the other individual difference characteristics. Specifically, the literature concerning relationships between vocabulary, preference for control, and prior knowledge will be reviewed. Literature on the relationships among working memory, vocabulary, and prior knowledge will also be reviewed.

A second major focus is the relationship between age and quality of decision rationale. The literature on this relationship will be reviewed next. Following this will be an examination of the intervening roles of verbal ability and information search within this age-rationale quality relationship. A final minor focus of the study is the preference of individuals for particular channels of information. The last section of this chapter will review the literature on relationships between individual differences and channel preference.

AGE AND INFORMATION SEARCH

In 1989 Sinnott published an influential paper describing qualitative and quantitative differences in the processing of information by adults during decision-making. Three information-processing approaches were delineated: youthful, mature, and old. The youthful style was characterized by a heavy reliance on information acquisition and processing. It was noted as a bottom-up processing style in which the new information formed the basis on which the decisions were made. The mature style

relied on new information to a lesser extent than the young style. Mature processors supplemented some of the information gathered regarding the specific problem with their prior knowledge and general understanding of how to solve typical problems in the domain. The mature style displayed a balance between top-down and bottom-up processing. The old style was characterized as seeking very little specific information, and was instead, reliant on past experience and general problem solving skills to find solutions. This distinction among age groups in their tendencies to seeking out and utilize outside information has been a resounding theme in much of the decision-making literature.

Johnson and her colleagues (Johnson, 1990; 1993; Riggle & Johnson, 1996) conducted several studies using decision scenarios, ranging from buying cars to evaluating political candidates, investigating the manner in which young and old adults seek out information before arriving at a decision. Johnson used a computerized process-tracing approach in which participants could select pieces of information on an information board. These boards consisted of a decision matrix of information. The matrix' columns indicated the decision options (eg., Apt. A, Apt. B, etc.), and its rows indicated certain characteristics of those options (eg., rent, location, etc.). Johnson allowed participants to uncover individual cells of information one at a time. In this way, the investigators could examine the number of cells uncovered as well as the order in which they are selected. Consistently, she has found that older adults utilize a decision strategy in which they seek significantly less information than young adults. Young adults tend to read the vast majority of information available. Other researchers have also found older adults utilizing less information search than younger adults in areas such

as financial planning (Hershey, Walsh, Read, & Chulef, 1990) and managerial work (Streufert et al., 1990).

Unfortunately, most of the studies utilizing process-tracing methods have not been conducted around medical treatment decisions. This field has more commonly been the focus of decision aid interventions and descriptive studies seeking to assess how patients have dealt with or are dealing with their own screening or treatment decisions. The majority of the intervention research has failed to investigate information search at all; rather they studied the effects of a specific body of information on participants' decision behavior and other outcome variables (Wolf & Schorling, 1998; Davison & Degner, 1997).

One notable descriptive study was conducted by Pierce (1993). In looking at how women made decisions about breast cancer treatment she found three common information processing styles. The first, the deferrer, consisted of women who reported not having made the decision, rather it was made by the physician or spouse. This decision maker often reported feeling as though there really was no decision to be made. The second style, the delayer, was characterized by an inordinate amount of wait time, almost as if to avoid having to make a decision at all. Finally, there was the deliberator, who was characterized by a great deal of information seeking regarding the nature of the treatment options and the possible outcomes. The deliberators took more time than the deferrers but less than the delayers and were much more informed about their situation than either group. The deliberators were also significantly younger than the women falling into the other decision styles.

Similar results were found by Meyer, Russo and Talbot (1995) in a survey of women who had survived breast cancer. They found that age was significantly related to the amount of information sought by patients, with the exception of those women with expertise in medicine who sought less information. Also reported in this article was another study which investigated the decisions made by women playing the role of a patient who had just found an abnormal lump in her breast. The scenario unfolded as the study participants made decisions regarding diagnosis and treatment options throughout the early course of the disease. The results indicated that younger women were less likely to choose a treatment decision early in the diagnosis and were more likely to have a systematic plan for seeking information regarding their options than were older women. However, the methodology for this study did not allow the investigators to actually track the amount of information participants sought during the decision making process. Rather, each individual, regardless of her choice or desire for more information, was given a standard continuation of the patient's circumstances including a number of sources of information that were the result of patient's supposed information seeking behavior.

Overall, age appears to be one factor influencing the amount of information sought by decision makers. However, an important question arises about the mechanisms by which age influences information search behavior. One reason for less information seeking with aging could be a desire to conserve cognitive resources in the face of age-related declines in the ability to process information (Leventhal, Leventhal, Schaefer, & Easterling, 1993; Salthouse, 1982, 1991). This theory would suggest that the reductions in processing abilities, such as working memory, create a need to alter the manner in

which older adults handle decision tasks. Competing explanations for less information search with age include an accumulation of knowledge concerning health issues across the lifespan. If more expertise were found in older men, then less information search might be expected. As found by Sinnott (1989) and others (Meyer et al., 1995; Streufert et al., 1990) decision-makers with domain expertise could rely on extensive prior knowledge to solve the problems. In this case, characteristics like prior knowledge could decrease the likelihood of seeking information. To better understand these possible explanations, several characteristics, which have been shown to relate to both age and information search behavior, are reviewed in the next sections of this literature review. Among them are the preference for control in decision-making, prior knowledge, vocabulary, and working memory resources.

ROLE OF CONTROL PREFERENCE IN INFORMATION SEARCH

How much involvement do patients want in deciding their treatments? Some research seems to suggest that the majority of patients are not interested in taking part in the treatment decision-making process (Davison, Degner, & Morgan, 1995; Degner & Sloan, 1992; Ende, Kasiz, Ash & Moskowitz, 1989; Sutherland, Llewellyn-Thomas, Lockwood, Tritchler, & Till, 1989), or if interested in theory, in practice, they only seek to have their questions answered under certain circumstances (Beisecker & Beisecker, 1990; Bilodeau & Degner, 1996). Other research shows an opposite trend with a majority of patients wanting at least a joint role in the decision-making process if not a completely controlling role (Davison & Degner, 1997; Hack, Degner, & Dyck, 1994). The seeming contradiction among research findings has been made more clear as

researchers clarified what was meant by decision-making in the context of generating and choosing treatments for diagnosed problems.

In the majority of the studies cited above control preference was measured by a card sorting task designed by Degner & Sloan (1992). This task asks patients to rank a set of cards depicting various patient-doctor interaction modes. The five cards are:

1) I prefer to make the final selection about which treatment I will receive.
2) I prefer to make the final selection of my treatment after seriously considering my doctor's opinion.
3) I prefer that my doctor and I share responsibility for deciding which treatment is best for me.
4) I prefer that my doctor makes the final decision about which treatment will be used, but seriously considers my opinion.
5) I prefer to leave all decisions regarding my treatment to my doctor. (p 943)

Deber and Baumann (1992, as cited in Deber, Kraetschmer, & Irvine, 1996) sought to determine if these questions asked of patients throughout these studies reflected a single construct or if there could be two unique aspects of the decision-making process not being separated. They made a distinction between problem solving, a process which involves finding a single right solution and often requires expertise, and decision-making, in which multiple answers could be construed as correct and where more emphasis is placed on preferences. As opposed to simply referring to a final treatment, Deber and Baumann denoted the type of decision that was to be made. For example, their scale includes questions such as "Who should determine what the risks and benefits for each treatment option are?" and "Given the risks and benefits of these possible treatments, who should decide how acceptable those risks and benefits are to you?" (p. 1415).

Using this new operationalization of patient participation, Deber et al. (1996) found that, indeed, patients were more likely to yield control to doctors in cases of problem solving while they maintained control over decision-making aspects of the treatment process. Therefore, it appears that medical decision-making involves some aspects which patients are very willing to allow physicians to have control over, such as the generation of a set of diagnostic procedures or medications for a particular illness or disease. On the other hand, the majority of patients desire control, in part or whole, when there are multiple valid options for treatment and where their own preferences, values, and goals may determine the most appropriate course of action. This may account for the shift seen in patient preferences across the past decade. Davison, Gleave, Goldenberg, Degner, Hoffart, & Berkowitz (2002) traced a decline in passive role preference in men with prostate cancer. In 1995 (Davison et al.), the rate of men preferring a passive role was near 60%, while in 2000 (Wong et al.), it was approximately 25%. This may signify that as men are becoming more educated about the lack of a single "right" decision for treatment of prostate cancer, they may interpret the situation posed in Degner's card sorting task as more decision-making oriented and therefore desire to take a more active role in the process of selecting an option.

Age Effects on Control Preference

Some individual differences in desire for decision control appear in the extant literature. Of them, age is most relevant to the present research. Deber et al. (1996) found age differences in desired control for decision-making such that older patients were more likely to prefer a passive role. They did not find an age difference for problem-

solving situations, though they note a lack of variance in the preference data. Ende et al (1989) also found that increased age correlated with more passive role preference.

In a sample of newly diagnosed cancer patients and members of the general public, Degner and Sloan (1992) found that older adults were less willing to take an active role in the making of medical decisions than were younger adults. They also found that men who had experienced reproductive cancer preferred a more passive role than others surveyed. Curley, Eraker, & Yates (1984) found that when given a hypothetical medical scenario that involved uncertainty of treatment outcomes, one-third of those participating chose to defer treatment choice to the physician. This tendency was greater in old (45% of 50 - 86-year-olds) than in young (20% of 16 – 39-year-olds).

These findings may stem from a cohort difference in the amount of trust patients place in their physician. Having been raised under a more paternalistic model of doctor-patient interaction, older adults feel less comfortable and less willing to play an active role in the decision process. Alternately, as suggested by O'Rourke (2001), a passive role preference may be a means of conserving energy in the face of a potentially overwhelming task. As cognitive resources decline, decision-makers seek to reduce anxiety and conserve their energy for other things.

Not all care facilities have a program of shared decision-making in place. Therefore, it often falls to the patient to seek after information. Thus, patients with greater desire to be actively involved in the decision-making process may be more likely to seek out the answers to their questions. Ende et al. (1989) reported that while desire for control in decision-making and desire for information were not correlated, they are both highly correlated with age and education. Hack et al (1994) found that, compared with

those desiring a passive role, breast cancer patients preferring an active role wanted more diagnostic detail and as much information about the treatment alternatives as possible.

The differences between these two studies could be in the fact that patients who prefer more passive roles are not as uniform in their desire for information as active patients. That is, Hack et al. (1994) found a subset of patients preferring a passive role who also desired detailed information about the diagnosis. However, they tended to want information regarding only a single treatment option. The distinction necessary at this point may be one of degree. Patients tend to want to be informed about what is going on with their body. However, to what degree are they willing to expend energy to seek out such information and at what point are they willing to be satisfied? Preference for control in medical decision-making appears to have a connection with information seeking, but more research is needed to determine its extent.

ROLE OF PRIOR KNOWLEDGE IN INFORMATION SEARCH

Information processing theory (Atkinson & Shifrin, 1968; Leahey & Harris, 1997) emphasizes the role of prior knowledge in the acquisition, organization, and maintenance of knowledge. Having prior knowledge allows for easier information acquisition. Johnson, Meischke, Grau, and Johnson (1992) found that women's knowledge about breast cancer was positively correlated with future desire to seek information. Other research related to expert-novice performance shows that increased knowledge facilitates the processing of new information by making it less taxing (Charness, 1989; Fiske, Kinder, & Larter, 1983).

In a non-medical decision domain, Devine & Kozlowski (1995) found that high and low domain knowledge participants sought information differently. These researchers

had college students with different levels of basketball knowledge decide which of four players should be added to the game given two different situations. The participants could seek information about eight characteristics of each player that could be chosen, as well as about the four players who were already in the game. They found that high domain knowledge participants sought out more information about the established players than did the low knowledge participants. In addition, high knowledge participants were more sensitive to the demands of the task such that when there was more uncertainty about the necessary skills for the incoming player, they sought more information than when it was clear that the player needed only to be an excellent free-throw shooter. Low knowledge participants showed no such task sensitivity.

These data indicate that increased knowledge can facilitate the seeking of information during decision-making. However, a common explanation for age related decreases in information search is an increased amount of prior knowledge (Sinnott, 1989; Hershey et al., 1990, Streufert et al., 1990). Increased prior knowledge, while allowing the opportunity to more easily gain new knowledge, allows the decision-maker to rely on previous experiences and information to make decisions. As such, those with high levels of prior knowledge might be expected to limit information search in favor of reasoning via well developed heuristics for the domain. Steginga, Occhipinti, Gardiner, Yaxley, & Heathcote (2002) noted a number of heuristics utilized by men making decisions regarding prostate cancer, but which are similar to those used in other domains. One such heuristic is satisficing. This strategy entails the hurried acceptance of one option because it meets a set criterion, without even considering the other options. Other commonly noted heuristics in medical decision-making include the expert-opinion

heuristic which diminishes the information search by following the doctor's orders, and an availability heuristic in which the decision maker relies on the most readily available memory they have regarding the options. An example of an availability heuristic would be a patient remembering his father's horrible experience with radiation therapy and thus he selects some other option without finding out more about radiation. In this way, decision makers are not required to seek out or use all of the information that is available to them, thus reducing cognitive demands.

While both increased and decreased information search are possible with increased prior knowledge, the present research emphasizes the role of prior knowledge in aiding the information search process. As such, a positive correlation between the two is expected. However, it is expected that prior knowledge will interact with working memory resources in such a way as to explain the tendency for decision-makers to reduce or increase information search.

Ericsson & Kintsch (1995) proposed an alternative manner of viewing the work of working memory. They note a working memory-type processing area in long-term memory that enables learners with high amounts of domain knowledge to circumvent limited short-term working memory (Kaakinen, Hyona, & Keenan, 2003). The long-term knowledge stores act as organizational tools used for active processing of information. As such, limited working memory would be less important in seeking new information if the learner were high in domain knowledge. Alternatively, the interaction between prior knowledge and working memory can be viewed in light of a need to reduce information search. That is, if working memory resources are high, the presence of prior knowledge is less influential in determining the amount of information sought during decision-making.

This may explain why some older adults choose to limit information search in favor of heuristics that rely on prior knowledge.

The Effect of Prior Knowledge on Control Preference

A reoccurring finding in medical decision-making is the desire to have the physician or someone else make the final treatment decision. While most researchers deem this to be a passive approach to participation, O'Rourke (2001) noted that among the factors that contribute to patients' desire to yield decision-making control to physicians are limited experience and knowledge. As such, a number of patient education programs have been initiated with the expressed goal of getting patients more involved in the decision-making process (see Stacey et al, 2001 for an inventory and evaluation of major interventions).

An underlying assumption behind this push toward patient education is the belief that preference for decision control is not a stable characteristic. Rather it is influenced by factors such as knowledge. Exposing individuals to particular information at the early stages of diagnosis or treatment appears to be important in influencing the patient's ultimate participation in the choice of diagnostic tools and treatment options. Davison, Kirk, Degner, & Hassard (1999) found that giving men information regarding the nature of a specific diagnostic test, prostate-specific androgen (PSA) screening, prior to their physical exam caused them to play a significantly more active role in the decision regarding its use.

Wolf and Schorling (1998) reported giving patients details about the controversy over PSA screening before administering the screening. They found that men given such information were less likely to desire the screening than were uninformed men. Similar

differences in screening choices have been found with varying forms of intervention (Barry, 2002; Flood, Wennberg, Nease, Fowler, Ding, & Hymes, 1996; Volk, Cass, & Spann, 1999). These studies have indicated that while the physician may have proposed screening for all of the patients involved in the study, those with this extra information were more willing to maintain control of their decision-making powers and potentially contradict the physician's advice. Volk and Spann (2000) note that the effects of PSA decision aids depend on the intentions of the patients. Men already seeking the screening are less likely to be deterred from their decision; however, even if the information does not change decision to screen, Davison et al. (1999) found a lower level of internal conflict regarding the decision in informed men than in those not receiving the information.

In the area of prostate cancer treatment decision-making, researchers have found an increase in active participation (Davison & Degner, 1997; Schapira, Meade, & Nattinger, 1997). Davison and Degner, utilizing an empowerment model derived from managerial research, showed that aiding patients' self-efficacy for finding the information they need yielded greater amounts of active participation and reduced anxiety. The intervention simply taught men and their partners what questions might be answered by the information they had received and where in the packet they could be found. Thus, increasing patients' belief that they can be in control of the decision through the use of information increased their desire to do so.

Age Effects on Prior Knowledge

The leading predictor of developing prostate cancer is age. Older men have lived with prostate cancer screening for longer periods of time and are more likely to have

personally experienced prostate disease (American Cancer Society, 2004). In addition, they are more likely to have close family and friends who have experienced prostate cancer. As a result, they are expected to have a greater amount of prior knowledge about prostate cancer, and cancer in general, than younger men.

ROLE OF VOCABULARY IN INFORMATION SEARCH

As noted earlier, the complexity of the medical decision-making process requires that patients be able to store and understand information about various aspects of their treatment options and outcomes (Appelbaum & Grisso, 1988; Yates & Patalano, 1999). The ability to process this information is based, in part, on basic processes of text comprehension such as vocabulary and working memory. Salthouse (1992) noted that general reasoning abilities were intermediary links between more basic cognitive processes and real-world decision-making. As such, differences in basic memory and comprehension processes will be reflected in how the decision process is approached.

Greater verbal abilities are believed to bolster a decision-makers ability to process the information needed to make a treatment decision. Meyer and Rice (1983, 1989) found that increased vocabulary in the older adults allowed them greater maintenance of text comprehension skills. This measure of crystallized intelligence is predominantly resilient across the lifespan. Schaie (1994) found that some measures of verbal ability (e.g., recognition vocabulary) increase through the 60s and 70s and then start to decline in the 80s. The degree to which this resource is maintained can be influential in the process of seeking information in medical decision-making tasks.

Direct evidence of the connection between information search and vocabulary is scarce in extant literature. Meyer et al. (1995) found that in addition to age, vocabulary

was a significant predictor of women's plans for seeking out information about a hypothetical breast cancer scenario. In addition, they found that increased vocabulary predicted an increase in women's report of different types of information they could use to gain knowledge about the decision. However, Johnson (1997) failed to find main effects of vocabulary on the search patterns of young and old adults making an apartment choice task. Interestingly, she did find that higher vocabulary predicted an increase in the degree to which participants utilized a decision aid while completing the task. This indicated that verbal abilities may play a key role in allowing participants to monitor and guide the information gathering processes during decision-making.

In addition to affecting information search, verbal ability has been implicated in patients' preference for control in medical decision-making. It has already been noted that prior knowledge influences the degree to which patients want to play an active role in decision-making. Similarly, higher verbal ability is believed to increase the likelihood of patients to desire control of their medical decisions. Indirect evidence of this relationship comes from research examining the role of education on control preference. Degner and Sloan (1992) found that education was predictive of active decision role preference. In addition, Hack et al. (1994) found that among the reasons patients gave for not desiring more control in the decision task was the lack of education. While there are many factors influenced by formal education, one of the most basic and influential is verbal ability. Therefore, vocabulary is anticipated to influence patients' preference for control in decision-making.

ROLE OF WORKING MEMORY IN INFORMATION SEARCH

In a manner similar to verbal ability, working memory provides a foundational resource used by decision-makers to gather and process information. Payne (1982) contended that as processing resources decline, decision-makers are most likely to alter their decision processes to reduce the amount of load placed on the information processing system. That is, since limitations in working memory make processing high volumes of information difficult, decision-makers will reduce their dependence on information from external sources. Yates and Patalano (1999) noted that this shift from an analytic approach to a rule-based or automatic approach was a natural progression. They suggest that as cognitive capacities diminish, as they have been shown to do with increased age (e.g., Salthouse & Babcock, 1991), increases in experience and knowledge take over most of the workload. Therefore, working memory deficits will predict decreases in information search.

Zwahr et al. (1999) found that processing resources, including working memory, were significantly correlated with decision-makers ability to comprehend and integrate the information given to them in their decision task. Specifically, these researchers found that when women were given the same amount of information to process during the decision, those with more processing resources were able to perceive more potential choices. This indirect evidence suggests that an increased ability to process information would facilitate the gathering of information during decision-making.

As alluded to above, age is related to working memory resources. Age-related decreases in working memory resources are well established in the extant literature (Craik & Jennings, 1992; Light & Anderson, 1985; Salthouse, 1991). Both speed of

processing and capacity diminish with increased age. As such, working memory resources are expected to provide an explanation for the relationship between age and information search.

EFFECTS OF AGE, VOCABULARY, AND INFORMATION SEARCH ON THE QUALITY OF DECISION RATIONALE

When judging the outcomes of a decision-making situation the most common measure of good decision processes is the option chosen. However, in the area of medical decision-making, determining the appropriateness of a particular option choice is extremely difficult. Yates and Patalano (1999; Yates, 1998) note that the process of decision-making is a subset of problem-solving in which the goal is to select an option with a satisfying outcome. The criterion of satisfying, however, means that individually based, value judgments are at the core of measuring the success of the decision process. One person may count as satisfying what another person counts as unacceptable. In addition, the uncertainty involved in the decision outcomes makes judgment of the decisions tenuous. Yates and Patalano note that the complications involved in having outsiders judge decision quality have led researchers to focus on reasoning and the absence of decision deficiencies, as opposed to the acceptability of the option itself. Therefore, it may be better to limit the conception of decision quality to an analysis of the manner in which decision-makers reason about their decisions.

Effects of Age on Rationale Quality

Meyer et al. (1995) sought to determine the quality of women's rationale related to a breast cancer treatment decision by investigating the degree to which they reflected vague or systematic justification. In this case the term systematic referred to either a

systematic strategy or to a detailed rationale. They found that young women tended to give more systematic justification for their treatment decisions than did old women. Fifty-three percent of old women gave vague rationales while 85% of young women gave systematic ones.

These researchers also investigated the number of causal and comparative statements contained within these treatment decision rationales. Both statement types were believed to reflect the process of gathering information and integrating it into a coherent argument. Meyer et al. (1995) hypothesized that young would produce more causal statements and more comparative statements. These predictions were confirmed in their data. No discussion of possible intervening variables was included in their analyses. However, some additional insight about these age differences can be gathered from research on how women make decisions about estrogen replacement therapy (ERT).

Effects of Vocabulary on Rationale Quality

Zwahr et al. (1999) also focused on the quality of decision rationale in terms of the number of comparisons made by women in their justifications. In addition, they rated the overall quality of the rationale as it related to the number of reasons for their choice or characteristics describing their choice. Zwahr et al. found that there were significant age differences in both measures of the quality of decision rationales, with younger women outperforming older women. In addition, they found that education and processing resources (i.e. working memory, processing speed, and reasoning) were also significantly related to rationale quality. Interestingly, when controlling for processing and verbal abilities, age effects on rational quality drop out of significance (M. D. Zwahr, personal communication, October 4, 2004). They concluded that age and education

indirectly affected rationale quality through their effects on processing resources. Processing resources then indirectly affected rationale quality through verbal ability. Zwahr et al. concluded that only verbal ability (a composite score consisting of vocabulary and text memory) directly affected rationale quality.

Effects of Information Search on Rationale Quality

Neither Meyer et al. (1995) nor Zwahr et al. (1999) allowed for variance in the amount of information sought by the decision-makers. Instead, each participant received the same amount of information during the tasks. As a result, there is no direct evidence within these studies regarding the potential effects of information search on decision rationale quality. However, Meyer et al. did measure the degree to which women had a plan for gathering information on which to base a treatment decision. They found that young women reported significantly more sources of information from which they could gather information than did middle-aged or old women. The authors, however, did not report any findings regarding a relationship between this heightened sense of where to gather information and the ability to generate a high quality decision rationale.

The potential impact of gathering information on the ability to produce better quality decision rationales is difficult to predict. Having more information on which to base a decision would allow decision-makers to better make decisions and more thoroughly justify them. Barry (2002) found that a number of studies which exposed men to information about prostate cancer treatment options altered the treatment selection men typically made. He found that these educational interventions provided the basis for selecting more conservative (i.e. non-surgical) management options. Presumably, the

additional information allowed men to formulate better reasons for not choosing a radical treatment approach.

Devine and Kozlowski (1995) found that greater prior knowledge facilitated increased information search and increased accuracy in decision-making. However, they did not note the relationship between information search and decision accuracy. It is not obviouse if the increased accuracy resulted from greater understanding already possessed by decision-makers or if it was due to the information gathered, or some combination.

The interaction between prior knowledge and information search in determining the quality of decision rationales is unclear. Three situations seem plausible. First, they could be acting independently. That is, prior knowledge increases rationale quality, and information search increases rationale quality; yet, there exists no relationship between the two. Second, they could be acting against one another. That is, prior knowledge and information search increase rationale quality, but greater prior knowledge decreases the likelihood of seeking new information. Third, they could be working in conjunction with one another such that prior knowledge facilitates increased information search which then facilitates increased quality of decision rationale.

If expertise and cognitive conservation were the driving force behind the effects of prior knowledge on rationale quality, we would expect the antagonistic relationship described above. Greater knowledge would predict lowered information seeking but higher rationale quality. In this case we could anticipate that lower information seeking might actually relate to poorer rationale quality, though this is not necessarily the case. Less knowledgeable decision makers would be forced to rely on the information they

gather to help them justify their decisions. In which case, increased information search would be related to rationale quality for these individuals.

However, if information processing theory drives the effects of prior knowledge on rationale quality, a cooperative relationship between prior knowledge and information search would be seen. Greater prior knowledge would facilitate greater information search which would produce higher rationale quality. Evidence for these competing models will be examined in this research.

INFORMATION CHANNELS USED BY CANCER PATIENTS

If information-seeking behavior is to be studied in an artificial, though realistic, scenario, it is imperative that the problem space reflects the types of information that patients would commonly seek. Part of this consideration includes the sources, or channels, of such information. The range of sources utilized by cancer patients is wide, spanning from medical journals and doctors to friends, family and *Reader's Digest*. Diefenbach et al. (2002) found in their study of men recently diagnosed with early stage prostate cancer that the most commonly used sources of information included their physicians as well as their spouse and friends, books, magazines, and TV. Each of these information sources was used by at least 50% of the 654 men surveyed. In addition, the Internet was utilized by 45%. Furthermore, 51% reported that their consultations with physicians were the most influential in helping them make a treatment selection. Steginga et al. (2002) reported that 73% of the 108 prostate cancer patients they interviewed sought information outside of their physicians. Also, 40% of their sample reported using the Internet, while fewer reported seeking information from friends (32%) or through second opinions (23%; an additional 26% intended to, but had not at the time of the

interview). In a series of studies, Johnson and Meischke (1991, 1994) found that women with breast cancer preferred varying sources for cancer related information. Specifically, they found that, in regards to the relative importance of TV, magazines, and newspapers, TV was utilized for cancer-specific information, while magazines were more frequent sources for coping with the emotionality of cancer diagnosis. When considering doctors, organizations, family/friends, and the media in general, they found that doctors were rated highest as a source for cancer-related information. Interestingly, some research has found that nurses are not perceived as significant sources of cancer information (Diefenbach et al., 2002; Bilodeau & Degner, 1996), while others find nurses to be a vital source for patient information (Ashbury, Findlay, & Reynolds, 1998).

Other variables have been found to mediate information channel selection. For example, Johnson and Meischke (1993) suggested a model that included demographics, direct experience, the salience and beliefs about the cancer as determiners of utilization, and characteristics of the type of information sources used. Part of this model included age, which has been found to positively correlate with the use of non-medical sources such as friends/family members, TV, and newspapers (Johnson and Meischke, 1992a; 1992b, 1993; Meischke and Johnson, 1995; Turk-Charles, Meyerowitz, & Gatz, 1997). Age has also been negatively correlated with use of the medical establishment as a primary channel (Turk-Charles et al., 1997).

Experience with cancer in one's social environment increases the likelihood of using family and friends as channels of information. James, James, Davies, Harvey, and Tweddle (1999) conducted a survey to investigate the potential need for a web-based information system for people with cancer. They found that 74% of people surveyed

wanted as much information as they could get. While all of the responders cited TV and people as their primary sources of information, those who had been or were currently cancer patients were more likely to report a desire to utilize the Web, despite a possible lack of computer experience. However, Meischke and Johnson (1995) found that TV was not equally utilized by everyone. They found that decreased education predicted increased reliance on TV for cancer information.

Finally, beliefs regarding the cost and benefit of information acquisition have been correlated with the utilization of authoritative sources, such as physicians. This relationship indicates that as the severity of the situation and the usefulness of knowing more accurate information increases, sources that are more highly esteemed for their accuracy are sought. This finding corresponds to the research concerning participation in medical decision-making in that as the severity of the medical scenario increases (high mortality situations), the degree to which patients give control over to doctors increases (Deber et al., 1996).

THE PRESENT STUDY

In selecting a decision topic for this study, several criteria were used. First, the medical situation had to be one that men would be likely to face in their lives. Second, it needed to be a medical situation for which there were several, equally acceptable treatment options. The third criterion was that there needed to be a good amount of information available to the general public so that an adequate decision space could be created. Finally, a situation that could be analogous to the research already conducted with women was preferable. Several medical situations were generated, including knee surgery, benign prostatic hypertrophy, and prostate cancer. Prostate cancer was selected

as fitting the first three criteria and providing a good fit with the plethora of research conducted with women on breast cancer.

According to the American Cancer Society's Cancer Facts and Figures, 2004, an estimated 230,110 new cases of prostate cancer will be diagnosed in the United States this year. It is the leading site of newly diagnosed cancer among men. Second only to lung cancer in estimated deaths for 2004 (29,900), prostate cancer will be a very real part of the lives of most men. Currently, age is the best predictor of being diagnosed with prostate cancer. While the chances of developing invasive prostate cancer before turning forty is less than 1 in 12,833, after your 60th birthday your chances grow to 1 in 7. Across a man's lifespan, he has a 1 in 6 chance of developing invasive prostate cancer.

As with many other forms of cancer, there is no miracle cure. Physicians disagree on the best way to treat early stage prostate cancer, with some promoting radiation therapy, some surgery and others watchful waiting. In reality, some medical communities suggest an "its better if you don't know you have it" approach when referring to early stage prostate cancer in older men. While this may seem abhorrent to many, this view stems from the unusually slow growing nature of the disease and with that, the reality that something else will probably cause one's death before prostate cancer. For this reason there has been much debate over the usefulness of early detection, and disagreement on whether the potential side effects of treatment options are worth it. However, once prostate cancer is diagnosed and if it is found in more advanced stages, the list of potential cancer treatments grows even more. At this point one can choose from a host of treatment options including surgery, chemotherapy, cryotherapy, radiation therapy, and others.

While not all of these treatments are recommended for each stage in the course of prostate cancer, the lack of agreement within the medical community as to which option to pursue makes this diagnosis similar to that of breast cancer for many women. Also similar to breast cancer treatment, prostate cancer treatment options carry with them risks of side effects that may be psychologically as well as physically profound. The most common side effects of prostate cancer treatment include incontinence and impotence with mortality, bowel damage, severe pain, and others being less likely.

This study sought to introduce a new paradigm into the process-tracing approach to studying decision-making. Instead of an electronic decision matrix, where the cell options are obvious and easily located, an interactive, web-based decision tool was used. This tool utilized the hyperlink capability of web pages to create a central scenario from which men could decide how to treat their newly diagnosed prostate cancer. At various points in the decision task, men were given opportunities to seek information or support from several sources. The amount of information and the sources from which it was obtained were tracked. With this tool, decision-makers could explore a complex network of information with relative ease. The participants' interaction with this tool provided a window through which their information desires and needs could be watched.

The purposes of the study can be explained in terms of the model depicted in Figure 1. The research has two main purposes. First, this research seeks to determine the degree to which age effects on information search can be accounted for by age-related changes in working memory, vocabulary, preference for control in medical decision-making, and prior knowledge. Second, it concerns the degree to which age effects on the

quality of decision rationales are mediated through the effects of age on vocabulary and information search behavior.

Each path in the model is numbered. Paths 1—4 represent the direct effects of age on the predicted intervening variables. Paths 5 and 6 depict the predicted effects of vocabulary and prior knowledge on the preference for active participation in the decision-making process, respectively. Each of the three paths leading to decision-making is anticipated to be significant while controlling for the effects of the other variables.

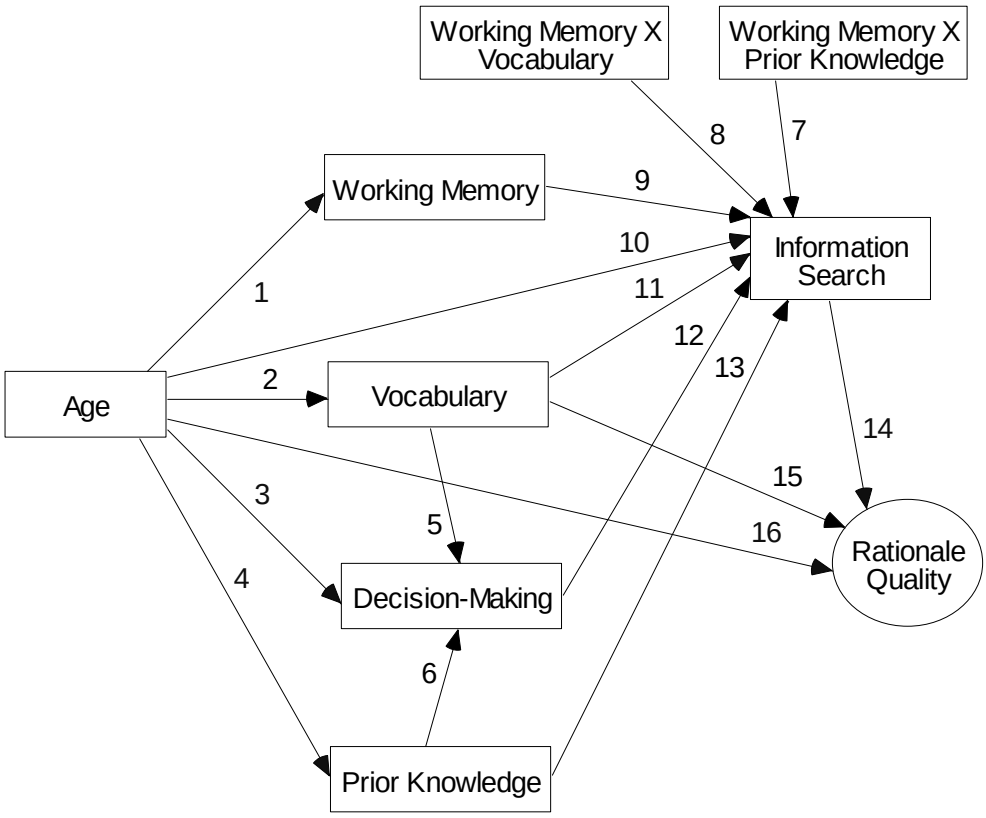

Figure 1. General Causal Model Explaining Age Effects on Information Search and Rationale Quality Through Changes in Working Memory, Vocabulary, Preference for Control in Decision-Making, and Prior Knowledge.

Paths 7 and 8 refer to interaction effects believed to affect the importance of working memory. Both vocabulary and prior knowledge are believed to lower the impact of working memory on information search. Despite these interactions the direct effects of working memory, vocabulary and prior knowledge are believed to be significant (see Paths 9, 11, and 13, respectively). While the simple correlation between age and information search is expected to be significant, Path 10 is not expected to be significant. Age is predicted to only indirectly influence information search through the other variables; therefore, when the effects of working memory, vocabulary, decision-making, prior knowledge and the two interaction variables are controlled (Paths 7—9 and 11—13), age should show no relationship to information search. Paths 14—16 refer to the mediation of age effects on rationale quality. Again, the simple correlation between age and rationale quality is predicted to be significant. Once the effects of vocabulary and information search are accounted for Path 16 should be non-significant.

The first hypothesis was that age would be significantly related to information search behavior, but when controlling for the effects of working memory, vocabulary, preference for control in decision-making, and prior knowledge, age would only indirectly affect information search. That is, Path 10 would not be significant while Paths 1—4, 7—9, and 11—13 would be significant.

The second hypothesis was that the preference for control in medical decision-making was predicted by age, vocabulary, and prior knowledge. That is, Paths 3, 5, and 6 were expected to be significant.

The third hypothesis was that the effects of working memory interact with vocabulary and prior knowledge. When vocabulary is high, the impact of working memory on information search is reduced. In addition, when prior knowledge is high, the impact of working memory is reduced. Therefore, Paths 7 and 8 were predicted to be significant.

The fourth hypothesis was that age would be significantly related to the quality of decision rationale, but when controlling for the effects of vocabulary and information search, age would only indirectly affect rationale quality. That is, Path 16 would not be significant while Paths 14 and 15 would be significant. In conjunction with this hypothesis was the hypothesis that vocabulary both directly (Path 15) and indirectly, through its effects on information search (following the route through Paths 11 and 14), affected rationale quality.

Finally, two hypotheses regarding channel preference were also included in this research. The first was that age would be positively correlated with the reliance on lay-resources. The second was that education would be negatively correlated with the reliance on videos.

METHODS

PARTICIPANTS

One hundred and twenty-one men, stratified across the adult lifespan were recruited from two small university communities (Lock Haven, PA and Ashland, OH) to take part in this study. The men were recruited by contacting local church groups, community centers, and through newspaper advertisements and flyers. Participants were given $20 as compensated for their time. All participants were required to be in at least fair health (self-reported) and be able to read print in 12 pt font and text from a computer in 14 pt font.

Of the 121 men, data from two men were dropped as a result of not meeting criteria for participation: one due to poor health status and another due to signs of early dementia. Prior knowledge data from a third man was lost due to a tape recording malfunction. This participant was not significantly different on any of the demographic or independent variables used in the study.

Data from the remaining 118 participants were submitted to preliminary analysis for the purpose of identifying univariate and multivariate outliers. One 22-year-old participant was identified as an outlier in several analyses as a result of extremely low scores on working memory and preference for control in health decision-making. In addition, his vocabulary score was below guessing potential and significantly different from the group. For these reasons, his data were not included in further analyses. The remaining 117 ranged in age from 20 to 87. A summary of the group's characteristics is presented in Table 1. For more detailed descriptive purposes the data have been reported by age group. It should be noted that the upper age groups are organized around a natural

Table 1

Sample Characteristics by Age Group

Variable	20-29 (*N* = 19)		30-39 (*N* = 16)		40-49 (*N* = 17)		50-59 (*N* = 20)		60-72 (*N* = 23)		73+ (*N* = 22)		
	M	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*F*
Age	23.8	(3.0)	34.8	(2.6)	44.7	(2.9)	54.0	(2.9)	65.2	(3.4)	78.7	(3.9)	
Education	14.7	(1.5)	15.4	(2.8)	16.2	(2.3)	15.7	(2.8)	15.7	(3.2)	13.1	(3.7)	3.30**
Working Memory (Successful Rspan Trials)	8.3	(2.2)	7.4	(2.3)	8.3	(2.1)	8.0	(2.7)	6.0	(2.4)	5.0	(2.0)	7.28***
Vocabulary (Quick Word Test)	47.0	(16.3)	49.3	(11.9)	52.2	(12.6)	57.0	(14.9)	53.4	(14.7)	50.6	(16.3)	1.10
Prior Knowledge about Prostate Cancer[a]	5.5	(5.1)	7.4	(5.3)	9.5	(8.8)	10.9	(5.9)	13.0	(5.7)	11.9	(5.9)	4.14**
Prior Knowledge about Cancer Diagnosis and Treatment[a]	6.8	(3.9)	8.4	(4.2)	10.0	(5.8)	9.6	(5.0)	12.3	(3.8)	9.5	(4.5)	3.21**
Preference for Control in Health Decision Making (PSDM)	24.0	(4.5)	22.8	(3.4)	24.4	(4.2)	22.8	(4.3)	22.2	(4.9)	18.2	(4.9)	5.10***
Health Status[b]	3.4	(.61)	3.4	(.63)	3.7	(.61)	3.4	(.60)	3.3	(.62)	2.8	(.61)	4.80***
Internet Use[c]	4.7	(.58)	4.8	(.40)	4.1	(1.56)	4.1	(1.25)	3.4	(1.82)	2.2	(1.62)	10.41***
Hours on Computer Weekly	16.4	(15.1)	15.9	(12.6)	15.1	(11.1)	13.2	(15.3)	8.7	(10.9)	2.8	(3.9)	4.04**

[a]Prior Knowledge: One point for each unique piece of accurate information recalled during a structured interview. [b]Health Status: subject ratings from 1 (*Poor*) to 4 (*Excellent*). [c]Internet Use: 5 (*At least 1/day),* 4 (*At least 1/wk),* 3 (*At least 1 every 2 weeks*), 2 (*At least 1/mo*), 1 (*Less than 1/mo).*

**p < .01. ***p < .001.

break at age 72. This allows for a more representative delineation between young-old and old-old (Baltes & Mayer, 1999; McGinnis & Zelinski, 2003).

Consistent with current data on computer use (Fox, 2004), older adults are less likely to report using the Internet and, in general, spend less time on computers. The older participants also report lower health status. The remainder of age differences are in line with hypothesized differences between age groups.

DESIGN

This correlational study utilized path-analytic analyses to estimate the direct and indirect effects of age, processing resources, verbal ability, prior knowledge, and decision role preference on information search behavior and decision rationale quality. Both classical multiple regression analyses and path analyses via structural equation modeling were implemented.

MATERIALS

Appendix A contains an ordered list of the materials presented to participants. In addition Appendices B through I include the materials themselves.

Demographic Information

The demographic questionnaire (Appendix B) asked for basic information regarding age, education level, and whether they were, are, or are in training to be a health care professional (nurse, doctor, physician's assistant, etc.). Computer use habits, such as types of programs used and how often, are included here as a gauge of participants' degree of familiarity with the main tool being used in this study.

Prior Knowledge

Prior knowledge was measured through an open-ended questionnaire responded to orally. The questionnaire was comprised of two sets of two questions (Appendix C). The first question of the first set asked the participant to "Please tell us what you know about prostate cancer. (what it is, risk factors, diagnostic tools, treatment options, treatment side effects, etc.)." The second question asked the participant, "Have you, a relative or someone else you know been diagnosed or treated for prostate cancer? If so, please tell us what you know about this person's experience (their treatment choice, progression of the disease, treatment side effects, current state of the cancer, etc.). If you know more than one person, please include as much information as you can about the two or three most meaningful to you."

The second set of questions was identical to the first with the exception that the underlined words were replaced with "other types of cancer." The open-ended nature of these questions allowed for the measurement of prior knowledge without informing or biasing participants on issues about which they may be unaware. The oral administration of this questionnaire was used to save participants, especially older ones, energy and to increase the likelihood of gathering valid data. Participants are likely to verbally report more details of their knowledge than they are to write them. The protocols were transcribed by secretarial staff. The primary investigator then scored them for three main types of knowledge: knowledge of prostate cancer, knowledge of cancer diagnosis and treatment, and knowledge of cancer not related to diagnosis and treatment. This scale was created by the researcher for the purposes of this study.

Working Memory

Working memory resources were measured with the Reading Span Test (Daneman & Carpenter, 1980). This task requires simultaneous processing and storage of information within working memory. A series of sentences were presented in sets of increasing number starting with 2 and ending with 6. The sentences in each set must be read aloud and the last word of each sentence recalled after the last sentence in the set is read. The participants must recall all of the words in at least three of the five sets given at each level in order to proceed to the next level. The reading span score was originally defined as the last level at which the participant correctly recalled at least three sets with an additional half point given for recalling two of the five sets at the next level. However, for the purposes of this research a common alternate way of scoring was used. The reading span was defined as the number of sets accurately recalled across levels (Zwahr et al., 1999). This adaptation increases the range and variability of the scale.

The sentences used in this measure range from 11 to 17 words in length and vary in syntactic structure with the natural variance found in everyday discourse. The sentences were presented one at a time on 4x6 inch index cards in 14 point sans serif font. The participants were instructed to read each sentence as soon as the index card was displayed. Immediately after the sentence was read the experimenter flipped to the next card, revealing the next sentence. Each successive sentence was presented in this manner so as to avoid allowing participants time to rehearse the last word of each sentence. At the end of a set, a blank index card appeared. This card signified to the readers that they should verbally recall the last word from each of the sentences presented in that set. At

the end of 5 sets an index card denoting a new level was displayed so that readers were aware of the increased number of sentences comprising each set.

Verbal Ability

Verbal ability was being assessed with the Quick Word Test (Quick; Borgatta & Corsini, 1964; Appendix D). The Quick is a 100-item multiple-choice test. Each item contains four choices from which the test taker must select the stem word's synonym. In previous studies (Meyer & Rice, 1983) it has been shown to have a correlation of .83 with the Vocabulary subtest of the Wechsler Adult Intelligence Scale (WAIS; Wechsler, 1955). Its advantage over the WAIS subtest is that it can be administered in a group setting and has thus been used in previous research on aging and reading (e.g., Meyer et al., 1995; Meyer & Rice, 1983).

Preference for Control in Medical Decision-Making

The Problem-Solving Decision-Making scale (PSDM; Deber et al., 1996; Appendix E) was used to measure the desire of patients to take part in medical problem-solving and decision-making. The PSDM was designed to differentiate the desire of patients to take part in making judgments regarding clinical matters, which require expertise, from their desire to take part in making judgments regarding patient values and quality of life issues, which require an understanding of personal goals and utilities. The scale consists of three medical scenarios one for each of the following three general classes: *morbidity*, *mortality*, and *quality of life*. For each scenario the reader was given a statement that describes the situation (e.g., "Suppose you had mild chest pains for 3 days and decided that you should visit your doctor about this."). Below the statement were listed 4 problem-solving and 2 decision-making questions (e.g., "Who should determine

(diagnose) what the likely causes of your symptoms are?" and "Given the risks and benefits of these possible treatment options, who should decide how acceptable those risks and benefits are to you?", respectively). For each question readers indicated their control preference on the following 5-point scale: 1 (*doctor alone*), 2 (*mostly the doctor*), 3 (*doctor and you equally*), 4 (m*ostly you*), 5 (*you alone*). The final question for each situations asked "How much experience have you had with the clinical situation described in the above statement?" Participants responded by circling all of the four provided statements that applied (The four statements involve personal experience, familial or close friend experience, knowledge from reading, and not much knowledge.) The internal consistency of the full scale is high (Cronbach's alphas are greater than .71).

The measure produced two scores; problem-solving and decision-making . These scores represented the average of the questions measuring each construct. Therefore, the problem-solving score is calculated from12 questions (four questions across three scenarios); while the decision-making score represents the average of six questions (two questions across three scenarios).

Prostate Health Decision Task

Prior to beginning the Prostate Health Decision Task (PHDT) participants were given a lined pad of paper for note taking and then introduced to the computer via a short tutorial. This tutorial consisted of two sections (Appendix F). The first involved reading a set of directions and moving the curser to the indicated hyperlinks. This portion of the tutorial taught what a web page and hyperlink are, different types of hyperlinks, how the cursor looks when activating a hyperlink, and how to use the scroll bar. The second section consisted of a hypothetical vacation decision. The participant was asked to

imagine a friend has offered a significant discount on a trip to Barbados. The participant was asked to collect information about this tropical destination in order to decide if he wanted to go there. This section introduced the participant to the various media being used in the PHDT. It consisted of one print resource, one web resource, and one video resource. The participants were asked to visit each resource so that they could gain an understanding of how each media was being treated (i.e. so that they could practice stopping the video, adjusting the volume, and accessing print material from the information board next to the computer).

All computer tasks were presented on a computer with 17 inch monitor and headphones. The right button on the mouse was disabled so that novice computer users wouldn't have to worry about accidentally activating the wrong button. The decision task was web-based and was run from Microsoft's Internet Explorer 6.0. Beside the computer was a board with several manila pockets attached. Each pocket contained one piece of print material that could be used in the decision task.

As with typical web pages, the movement between pages was accomplished through hyperlinks, which were written in blue font, as opposed to black, and were underlined. The participant simply placed the cursor, via the mouse, over the hyperlink and clicked the left mouse button (the only button that was enabled). While the participant was encouraged to only use the navigation links within the program, the browser's navigation bar was present at the top of each page. This allowed participants to utilize the "back" or "forward" keys if they get lost in the decision task.

After the introductory tutorial, participants moved to a screen that introduced the medical decision scenario (Appendix G). Participants were told that they would be

required to make a hypothetical medical decision. They were reminded that all people are different and that the study was most interested in how they typically go about making decisions. Throughout the task, they were asked to be true to their way of doing things. After emphasizing this individuality, participants were asked to assume the identity of a healthy, married, and active 60-year-old man. With this identity, participants immediately found themselves in the process of undergoing diagnosis for potential prostate caner.

This scenario was selected because of the necessity to standardize the decision task and increase the decision difficulty. An otherwise healthy 60 year old should have a life expectancy of at least 10 years (an important criteria for consideration of the radical prostatectomy treatment option) and be young enough to still have interest in maintaining sexual potency. The fact that he is active also suggests the importance of being continent. The participants were encouraged to interact with the decision task as they would in real life. However, they were also encouraged to remember that they were assuming the characteristics and clinical data of the 60-year-old.

When the participants finished reading the introductory page, they were required to explain to the researcher what they were supposed to do. When satisfied that the participant understood the task, the researcher guided the participant to click a hyperlink that began the decision scenario.

The scenario itself consisted of actual resources available to the public. These resources were collected and organized via major portals throughout the decision space. The primary scenario involved the interactions of the patient with an urologist. The patient was presented with data from diagnostic tests and other results in an unfolding scenario. All of the data given to the patients by the doctors were the product of

substantial research in medical journals and other sources. The clinical factors were selected so that the patient was presented with a potentially serious, but at the same time, potentially ignorable situation. In doing this, all options would be considered viable. The decision was thus a matter of personal preference for treatment outcomes and adherence to physician recommendations.

Throughout these decisions there were opportunities to gather information from varied sources. The decision scenario ended when the patient either refused further diagnostic testing or made an initial treatment decision. Appendix F summarizes the major scenario information, treatment decision points and resource decision points within the PHDT. After selecting a treatment option participants were told that they were finished with the computer. They were then instructed to complete the Decision Rationale measure.

Decision Rationale

Appendix H contains the decision protocol sheet. At the top participants were asked to write the treatment choice they selected. If they chose “other” they were asked to delineate what they would do. The next question on the page asked “What were the main factors that influenced your decision?” The rest of the page and the reverse side were lined so that participants could write their responses. This protocol was untimed and participants were free to reference any notes they might have taken during the course of the decision task, however they were not permitted to return to the decision task. After the participant finished with the written protocol, the experimenter asked for a verbal description of the participants’ answer to the same question. Participants were

encouraged not to read their answer, but, rather, to report their answer as they thought about it. The written report forced participants to be more organized in their recall of significant factors. However, the verbal report allowed participants to add details and explanations that they might otherwise have left out because of lack of energy or desire to write.

PROCEDURE

The study took place over one 1 to 3 hour session. The researcher met participants in a common room. They were seated and given the consent form. After signing the consent form, the participants were asked if they cared for anything to eat or drink. They were told that while they were in this room, they should feel free to get up and help themselves to refreshments. Participants were then given the background questionnaire. Once participants finished the background questionnaire they were led back to an isolated room by the researcher conducted the one-on-one portions of the study. The prior knowledge questionnaire was then administered and recorded. Participants were handed a copy of the questions and told that they would be asked to respond verbally to the questions one at a time. The experimenter then turned on the tape recorder and read the first question. Once the participant responded to each of the questions the recorder is stopped.

Participants were then introduced to the computer setup and shown the mouse and computer display. Participants went through the tutorial and when they felt comfortable navigating through the medium they were given a pad of lined paper. Participants were told that if they want to remember information for future use they were welcomed to take notes. Next, they began the PHDT. Throughout the participant's time in the tutorial and

PHDT, the researcher was close at hand: sitting outside the participant's line of view. Researchers were available to answer navigation questions only. At the end of the task, the participant was given the decision rationale measure and verbally instructed to write down the treatment option they chose and to detail the main reasons for their choice. After completing the written account, the researcher asked participants to verbally describe the main factors that influenced their decision. The verbal response was recorded.

These tasks were followed by the Reading Span Test. Once the Reading Span Test was finished the participants were brought back to the common room and given a short break. Again, food and drinks were available to them. When ready, participants were given the Quick and PSDM. Finally, participants were given a sheet with debriefing information (Appendix I) and were told that if they wished, they would be sent the results of the study when it was completed. A pad where participants could list their names and addresses for this purpose was available in the common room. Any questions the participants had were addressed. Afterwards participants were given an information packet about prostate cancer and payment for their participation.

SCORING

Prior to running the study, participant identification numbers were placed at the top of each page of data. After a participant completed the study, the individual measures were separated for scoring purposes. The numbers were assigned in order of testing so that there was no indication of participants' ages or other characteristics during the scoring process.

Prior Knowledge

The recorded responses to the prior knowledge questions were transcribed by staff unfamiliar with the research. The prior knowledge questions were then scored by the experimenter for the presence of information relevant to one of four categories: a) diagnosis and treatment of prostate cancer, b) other knowledge of prostate cancer, c) diagnosis and treatment of other forms of cancer, and d) other knowledge of other forms of cancer. Answers to the four questions were scored as a whole so that information contained in any of the answers could be scored in the appropriate category and so that repeated information was not scored more than once. Appendix I contains the formal scoring rules used to allocate points to information categories. In general, one point was given for each statement that reflected any factual knowledge about cancer that had not already been scored (e.g., what cancer is, how it is detected or diagnosed, treatment options, side effects, cure rates, etc.). The resulting scores from the four categories were combined to produce three overall scores: a) total prostate cancer knowledge, b) total cancer diagnosis and treatment knowledge, and c) total cancer knowledge.

Two reliability estimates were gathered. The first was on pilot data using 32 written protocols scored one week apart. Intra-rater reliability for the initial four categories of knowledge ranged from .884 to .967. The intra-rater reliability across the three combined scores ranged from .94 to .99. Another 10% of the protocols from the main study were scored twice with a one week time period between scorings. The reliability estimates for the three combined scores ranged from .97 to .98.

Information Search Behavior

Amount of information used. During the PHDT a log of information search behavior was created. This log contains information regarding which pages were accessed, the order in which they were accessed, and the duration the participant viewed each page. This information was used to tally the number of resources used during the decision task. Intermediary pages which only serve as portals to other information sources were not included in the tally. One point was given for each unique information source accessed for more than three seconds. This time criterion was applied so as to exclude unintentional page activations and those pages that were simply traveled through without being read. Redundant page referencing was not included in the total of information sources. The resulting score was count data, but was treated as continuous data.

Channel preference. Channel preference measures were taken from the same log mentioned above. Each resource was categorized as belonging to one of the following sources: organization-resource or lay-resource (prostate cancer survivors, friends, family, newspapers, magazines, etc.). In addition, each resource was categorized as belonging to one of the following three media: print, electronic, and video. For the purposes of interpretation clarity, opinions from medical professionals and human lay-sources were not included in the media categorization. While each of these was a proxy for human interaction, the lack of actual interaction made these resources difficult to categorize.

Both source preference and media preference were measured by the number of resources used for each type of source and type of media. So that if a man were to view three cancer survivors' opinions and four organizational resources his score for the lay-

resource and organization-resource would be three and four, respectively. This count was then converted into a proportion of the total number of resources accessed. This conversion was undergone to minimize the effects of amount of information search on source and media preferences.

Decision Rationale

The decision rationales were be scored in three ways. Two represented adaptations from scales used by Zwahr et al. (1999) and Meyer et al. (1995). The first score was a dichotomous variable reflecting the accuracy of the rationale as it related to the actual decision scenario. Participants "(a) who gave an inaccurate or erroneous description of the selected treatment option or (b) who gave a reason not specific to the problem represented" (Zwahr et al., p.183) received 0 points. All other answers were scored as 1 unless no answer was given, in which case the data were coded as missing. This score, however, produced no variance amount participants and is therefore not included in the results of this study. The second score was similar to that used by Zwahr, et al. This was a count of the number of "specific reason[s] directly related to the problem represented in the [task]" (Zwahr et al., p.183). The present research was more interested in the amount of information utilized within the reasoning process. As such, a count of the amount of information considered in the decision rationale was used. One point was awarded for each non-redundant piece of information reported. The intra-rater reliability for this measure was estimated by rescoring 10% of the protocols at least one week after initial scoring. The resulting reliability for the amount of information considered in the rationale was .97.

Third, the decision rationales were scored for the number of comparative statements made regarding treatment options. Comparative statements were scored according to Meyer's prose analysis system (Meyer, 1975; 1985). One point was allocated for each statement which indicated similarities or differences between medical opinions, treatment options, or any other factors relevant to the treatment decision. Examples included the delineation of different outcomes for various treatment alternatives and similar treatment suggestions by different information sources. The intra-rater reliability for this measure of rationale quality was estimated in the same manner noted for the other measures. The reliability for the number of comparison statements was .95.

RESULTS

OVERVIEW OF ANALYSES

The results are presented in two major sections. The first represents the analyses that test the general causal model (see Figure 1). Within this section, path analysis methods are used to test the hypotheses that age only indirectly affects information search and quality of decision rationale through its influence on working memory, vocabulary, preference for control in health decision-making, and prior knowledge of cancer diagnosis and treatment. Also in this section is a presentation of a model that has been optimized for the data.

The second section focuses on testing the hypotheses related to channel preference. It examines how age, education, and the other variables within the general causal model are related to a reliance on different types of media and different sources of information.

Data from 117 men were used to investigate the relationships between age, working memory resources, vocabulary, preference for control in health decision-making, prior knowledge of cancer diagnosis and treatment, information search and the quality of decision rationale. A log transformation was applied to the information search variable due to its skewed distribution (Cohen & Cohen, 1983). The zero-order correlations between these variables are displayed in Table 2. While some of the predicted associations between variables were not significant (e.g. between age and vocabulary), all aspects of the model were tested as hypothesized prior to trimming paths.

Table 2

Zero-order Correlations (N = 117) for Variables in the General Causal Model

Variable	1	2	3	4	5	6	7
1 Age	--						
2 Working Memory	-.457***	--					
3 Vocabulary	.088	.314***	--				
4 Decision-Making	-.357***	.240**	.152	--			
5 Prior Knowledge	.255**	.042	.312***	.045	--		
6 Information Search	-.415***	.323***	.189*	.237**	.007	--	
7 Rationale Quality: Information Considered	-.341***	.436***	.289**	.172	.357***	.350***	--
8 Rationale Quality: Comparisons	-.362***	.403***	.274**	.159	.207*	.325***	.806***

*p <.05, **p < .01, ***p < .001

Age, Vocabulary, and Prior Knowledge Effects on Decision Making

It was hypothesized that decreased age, increased verbal ability, and increased prior knowledge facilitate an overall desire for control in health decision-making. In addition to these direct effects on decision-making, age was hypothesized to indirectly affect decision-making through its influence on vocabulary and prior knowledge. These hypotheses were tested using multiple regression analysis. Pedhazur and others (1982; Cohen & Cohen, 1983; Zwahr et al., 1999) note that in the absence of latent variables (all

variables are observed) the path coefficients between variables in a causal model can be estimated by the regression weights from a series of multiple regression analyses. There is one analysis for each endogenous variable in the model. In each analysis the endogenous variable is regressed on each of its exogenous variables. Since the regression coefficient is equal to the Pearson Product-Moment correlation in analyses with only one exogenous variable, simple correlations were conducted to test the paths between age and both vocabulary and prior knowledge. The remaining paths were tested via a multiple regression analysis in which decision-making was regressed on age, vocabulary and prior knowledge of cancer diagnosis and treatment.

The resulting correlations and standardized regression coefficients are shown in Figure 2. The direct effect of age on prior knowledge was significant ($r = .255$, $p < .01$), showing that older men recalled more information about cancer diagnosis and treatment. The direct effect of age on vocabulary was not significant ($r = .088$, *ns*). The direct effect of age on decision-making was significant ($\beta = -.396$, $p < .001$), indicating that younger men tend to desire more control in health decision-making. In addition, there was a trend for increased vocabulary to relate to increased preference for control in decision-making ($\beta = .157$, $p = .065$).

Vocabulary and Prior Knowledge as Moderators of the Working Memory Effects on Information Search.

The general causal model proposed in this research included two interaction effects. Cohen and Cohen (1983) note the difficulty of finding significant interaction effects in hierarchical regression analyses. Therefore, prior to entering the interaction

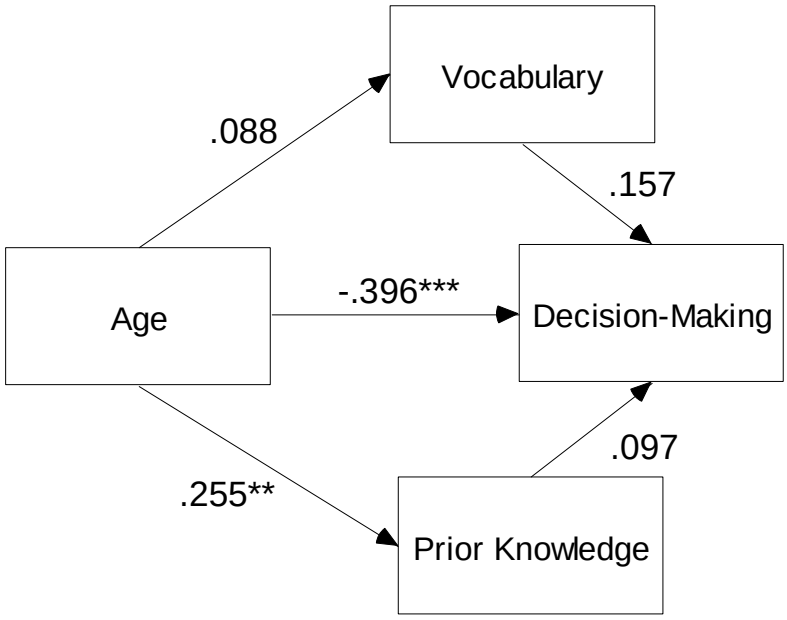

Figure 2. Path Coefficients for Control Preference in Medical Decision-Making Regressed on Age, Vocabulary, and Prior Knowledge.

$^{**}p < .01$, $^{***}p < .001$

terms into the overall model, hierarchical regression analyses were conducted to determine the degree to which the effect of working memory on the amount of information search was moderated by vocabulary and prior knowledge of cancer diagnosis and treatment. Independent regression analyses were run for vocabulary and prior knowledge. In each regression analysis, product-term interaction variables were created by multiplying the mean-centered working memory score by the mean-centered moderator variable score (Jaccard, Turrisi, & Wan, 1990; Cohen & Cohen, 1983). This interaction term was then entered last in a regression equation containing the mean-centered scores for working memory and the respective moderator variable.

It was hypothesized that increased vocabulary would lessen the importance of working memory in the information search process. However, no evidence was found of this relationship (Working Memory X Vocabulary $\beta = .057$, *ns*). The strength of the association between working memory and information search was also hypothesized to decrease in light of increased prior knowledge. Again, no evidence was found for this effect (Working Memory X Prior Knowledge $\beta = .057$, *ns*). As a result of these findings, the interaction terms were eliminated in an effort to simplify the general causal model.

Working Memory, Vocabulary, Decision-Making, and Prior Knowledge as Mediators of Age Effects on Information Search

Several hypotheses were presented concerning variables believed to influence information search. Working memory, vocabulary, decision-making, and prior knowledge were all predicted to directly affect the amount of information sought by men. In addition, it was hypothesized that age only indirectly affects information search through its influence on these variables. Therefore, the direct effect of age on information search was predicted to be non-significant when the effects of working memory, vocabulary, decision-making, and prior knowledge are held constant. Vocabulary was hypothesized to have an indirect effect on information search through its influence on decision-making. A path analysis, using AMOS 5.0 structural equation modeling software (Arbuckle, 2004), with the log of information search (hereafter referred to as information search) regressed on these five predictor variables was conducted to test the hypotheses. This method was chosen over the multiple regression analysis because it provides more stable estimates of the path coefficients as a result of the ability to estimate

measurement error in the variables (P.-W. Lei, personal communication, September 1, 2004).

Figure 3 shows the path coefficients for this analysis. While age was significantly correlated with working memory, decision-making and prior knowledge, none of these variables had significant effects on information search. Of the predicted direct effects on information search, only vocabulary was significant ($\beta = .179$, $p < .05$). The resulting standardized regression coefficient for age ($\beta = -.391$, $p < .001$) remained relatively unchanged after partialing out the linear effects of working memory, vocabulary, preference for control in health decision-making, and prior knowledge. The hypothesis that age only indirectly affects information search was not supported (cumulative indirect

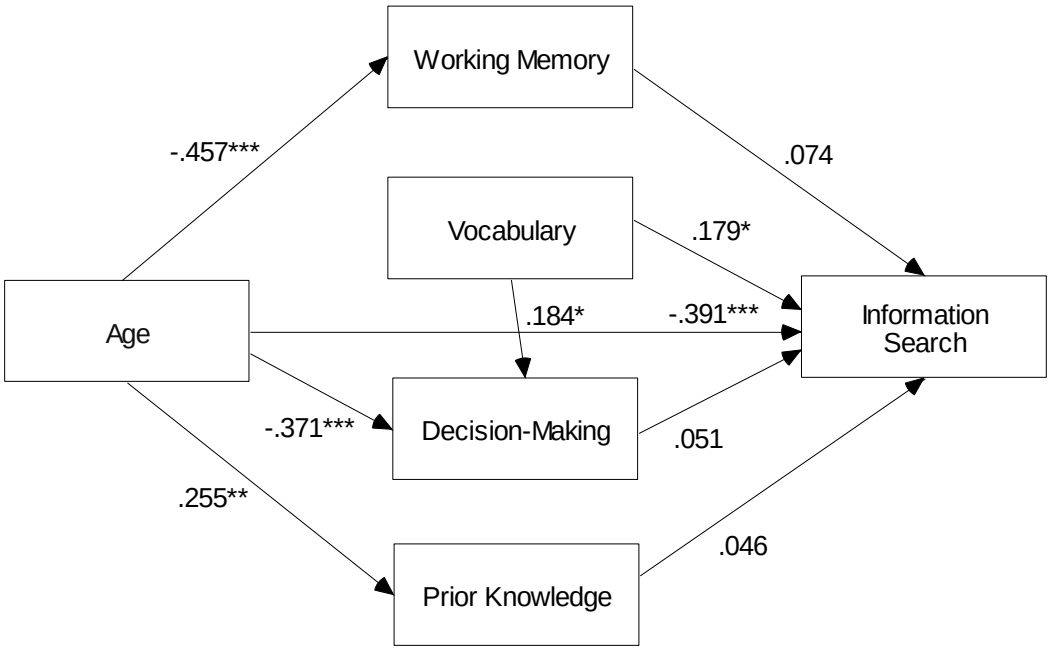

Figure 3. Path Coefficients for Analysis of Mediated Age Effects on Information Search

$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

effects of age on information search = -.041). The association between age and the amount of information sought during the decision-making process appeared to be independent of the effects of the set of predicted mediating variables.

In an effort to better understand the lack of mediation effects, the variables were analyzed in isolation for their effects on the relationship between age and information search. Table 3 shows results from four, three-variable regressions. In each analysis information search was regressed on age and one other independent variable (labeled in the left-most column of Table 3). Columns 1 and 2 indicate the bivariate correlation between information search (*Y*) and the mediating variable (*X*) and between information search and age, respectively. The standardized regression coefficients (beta) from the regression analyses appear in columns 3 and 4. Columns 5 and 6 indicate the percent of variance accounted for by the independent variable after the influence of the other independent variable has been partialed out. The last column indicates the overall variance accounted for in the full regression analysis. Two main findings can be seen in this table: the mediation effects of working memory and decision-making (compare columns 2 and 4 for working memory in Table 3), and the suppression effects of vocabulary (compare columns 2 and 4 for vocabulary in Table 3) and prior knowledge (again not the higher beta weights in column 4 for prior knowledge).

Working memory ($\beta = .168$, $p = .079$) and decision-making ($\beta = .102$, $p > .05$) failed to significantly mediate age effects. Though not significant, an examination of the reduction in beta for age in both analyses (compare columns 2 and 4 in Table 3) indicated that they were acting in the direction of mediation. This lent some support to the hypothesized relationships. However, of greater interest, or at least of greater relevance to

Table 3

Age Effects on Information Search (Y) "Mediated" Individually by Working Memory, Decision-Making, Vocabulary and Prior Knowledge.

	1	*2*	*3*	*4*	*5*	*6*	*7*
Mediating Variable (*x*)	r_{yx} (r^2_{yx})	r_{yage} (r^2_{yage})	$\beta_{yx.age}$	$\beta_{yage.x}$	$r^2_{y(x.age)}$	$r^2_{y(age.x)}$	R^2_{yxage}
Working Memory	.323*** (.104)	-.415*** (.172)	.168	-.338***	.022	.090	.195
Decision-Making	.237* (.056)		.102	-.379***	.009	.125	.181
Vocabulary	.184* (.036)		.228**	-.435***	.051	.188	.224
Prior Knowledge	.007 (.000)		.121	-.446***	.013	.186	.186

Note: The correlation between information search and age (r_{yage}) and the variance in information search accounted for by age (r^2_{yage}) are constant across all analyses and therefore not repeated down the column. Underlined elements are related to suppression effects.

*$p < .05$, **$p < .01$, ***$p < .001$

the lack of mediation effects for the full model, were the suppression effects of vocabulary and prior knowledge.

Conger (1974) defined a suppressor variable as:

> . . . a variable that increases the predictive validity of another variable (or set of variables) by its inclusion in a regression equation. This variable is a suppressor only for those variables whose regression weights are increased. (p 36)

Figure 4 uses Venn diagrams to depict the difference between mediation and suppression effects. The diagram on the left indicates a typical relationship between three variables. When the variance in Information Search accounted for by Decision-Making is removed, the predictive power of Age is decreased. However, the diagram on the right represents a different type of relationship.

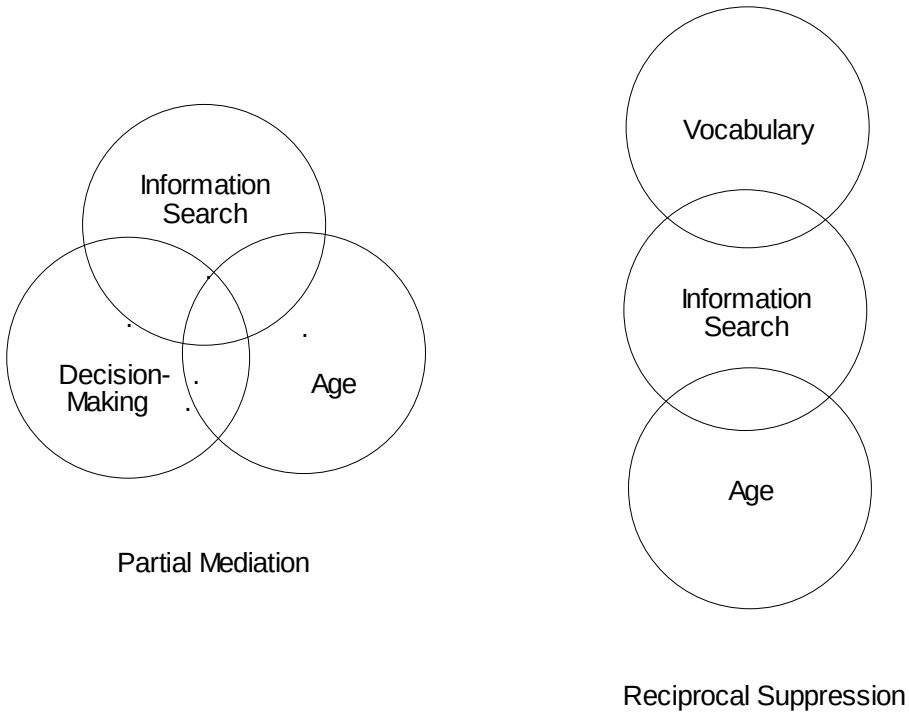

Figure 4. Venn Diagrams Depicting Mediation and Suppression Effects

There are several types of suppressor situations, but the mechanism behind each is the same. The suppressor has variance in common with either or both another independent variable and the outcome variable. This common variance is irrelevant to the relationship between the independent variable and the outcome variable (In the case depicted in Figure 4, the variance is shared only with the outcome variable). When entered into the regression equation, the suppressor removes this portion of variance that would otherwise be attributed to error. This leads to an increased ability of the independent variable to predict the outcome variable. One way of conceptualizing the suppression effect is that the variance in the outcome variable due to the suppressor (Vocabulary) is belying the strength of the relationship between the independent (Age) and outcome variables (Information Search). In some situations, the predictive powers of both the independent and suppressor variables increase. This is termed *reciprocal suppression* (Maassen & Bakker, 2001).

By again comparing columns 2 and 4 in Table 3, it is evident that the standardized regression coefficients for age increased as a result of the inclusion of vocabulary and prior knowledge. In addition, the coefficients for both suppressor variables increased (columns 1 and 3). While the effect for prior knowledge was not significant ($p = .169$), the effect for vocabulary was significant ($p = .007$). Column 6 indicates that vocabulary accounted for an additional 5.1% of variance in information search above that which was already accounted for by age. These effects explain, at least in part, the lack of overall mediation by the general causal model predicted by this research.

Another possible statistical explanation should be noted. Within the analysis, there was a good deal of multicolinearity among variables. The tolerance for both age

(.610) and working memory (.660) were considerably low. The redundancy of working memory, decision-making, and prior knowledge with age is a plausible reason for their inability to account for unique variance in information search.

Predictors of Decision Rational Quality

Two variables were predicted to have direct effects on the quality of decision rationale: vocabulary and information search. In addition, vocabulary was expected to have a significant indirect effect on rationale quality through its influence on information search. Age was also predicted to have significant indirect effects on rationale quality via the effects of working memory, decision-making, and prior knowledge on information search and then in turn on rationale quality. However, analysis of direct effects on information search showed that working memory, decision-making, and prior knowledge did not account for a significant amount of unique variance in information search above that accounted for by age and vocabulary. Since there were no significant paths between information search and these variables, they could not mediate age effects. They have been dropped from the analysis on the quality of decision rationale.

To test the hypothesis that age only indirectly affects rationale quality when the effects of vocabulary and information search on rationale quality are held constant, a path analysis was conducted. Rationale quality was represented by a latent variable generated from two measured variables: the amount of information considered and the number of comparison statements. This latent variable (hereafter referred to as rational quality) was regressed on information search, vocabulary and age. In addition, a path accounting for the direct effects of age on information search found in the previous analysis was added to the model.

Figure 5 shows the path coefficients for the model while Table 4 shows the direct, indirect and total effects of the variables on quality of decision rationale. The significance levels for indirect effects were estimated by using the Sobel test of mediation (Sobel, 1982, Preacher & Leonardelli, 2003). There was no support for the hypothesis that age effects on quality of decision rationale were completely mediated by vocabulary and information search. However, its total effect was partially mediated by information search. Increased age predicted lower amounts of information search that in turn predicted lowered rationale quality. This effect, however, was lessened in the presence of increased vocabulary scores. Vocabulary both directly ($\beta = .307$, $p < .001$) and indirectly, through information search, affected the quality of men's decision rationale.

OPTIMIZED CAUSAL MODEL

After testing the proposed model, an optimized model was built to significantly explain performance on information search and quality of decision rationale, while providing for the greatest mediation of age effects. The model-building process began with an elimination of those variables not significantly related to these outcome variables. The mediation analyses discussed above served as a starting point whereby variables were included into the regression. However, unlike the earlier model, no assumptions were made regarding the relationships of rationale quality with working memory, decision-making, and prior knowledge. Each of these paths was included in the model. Those variables not explaining a significant portion of unique variance in the outcome variables were subsequently dropped prior to reanalysis.

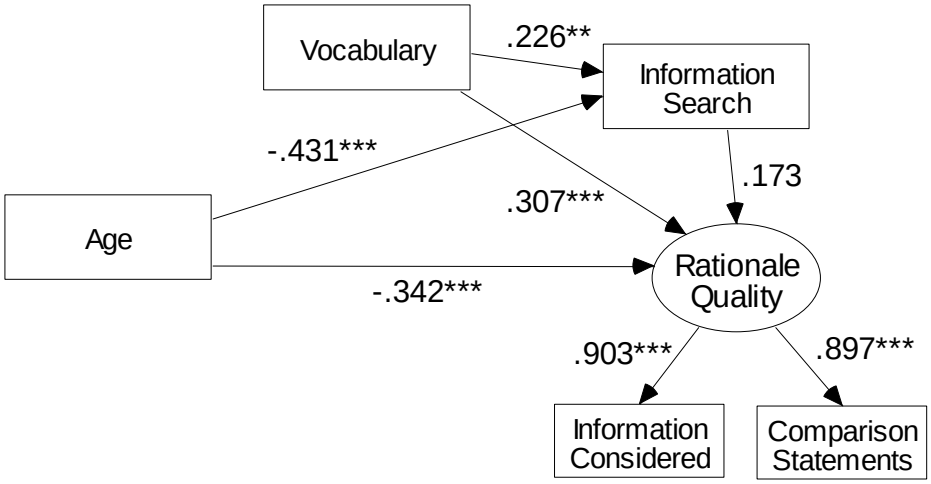

Figure 5. Path Coefficients for the Model of Quality of Decision Rationale

$^{**}p < .01$, $^{***}p < .001$

Table 4.

Direct, Indirect, and Total Effects for Model of the Quality of Decision Rationales

Effects variable	Direct effects	Indirect effects	Total effects
Age	-.342***	-.075[a]	-.416
Vocabulary	.307***	.039	.346
Information Search	.173[b]	----	.173

Note: Rationale Quality: $R^2 = .31$

[a] $p = .087$, [b] $p = .071$

*** $p < .001$

Information Search.

The optimized portion of the model predicting information search included only age and vocabulary (see Figure 6). This simplified model accounted for 8.5% more variance in information search (R = .473, $F(2, 114) = 16.43$, $p < .001$, R^2 = .224) than the predicted model which included only working memory, vocabulary, decision-making, and prior knowledge.

Quality of Decision Rationale.

In contrast to the model simplification seen in predicting information search, the number of variables significantly predicting the quality of decision rationale increased as a result of optimizing the model. The changes to this part of the model were substantial due, in part, to the intercorrelation between variables considered for the model (e.g., vocabulary and prior knowledge). This multicolinearity caused some paths which were previously significant in the model to no longer be significant.

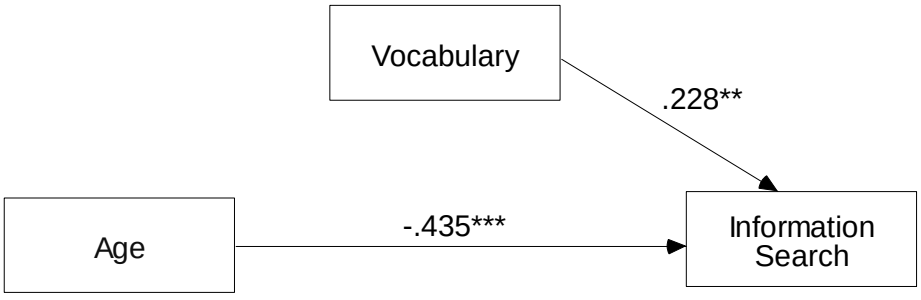

Figure 6. Path Coefficients for Optimized Model which Includes Age and Vocabulary Predicting Information Search

**$p < .01$, ***$p < .001$.

The resulting optimal model with path coefficients is shown in Figure 7. The model indicates that vocabulary only indirectly influenced the quality of decision rationale through its effects on information search. Age has both a direct and indirect influence on rationale quality. Indirectly, age affected rationale quality via its influence on information search, working memory, and prior knowledge. Table 5 shows the direct effects, indirect effects, and total effects, as well as R^2, for the variables in the model. This more complex model accounted for 7.8% more variance in rationale quality than did the model with only age, vocabulary, and information search (see Figure 5). In addition, in the optimized model there was more mediation of the direct effect of age on quality of decision rationale than the hypothesized model; however, the direct effect of age on decision rational was still significant (β = -.282, p = .002). Increased age reduced the quality of

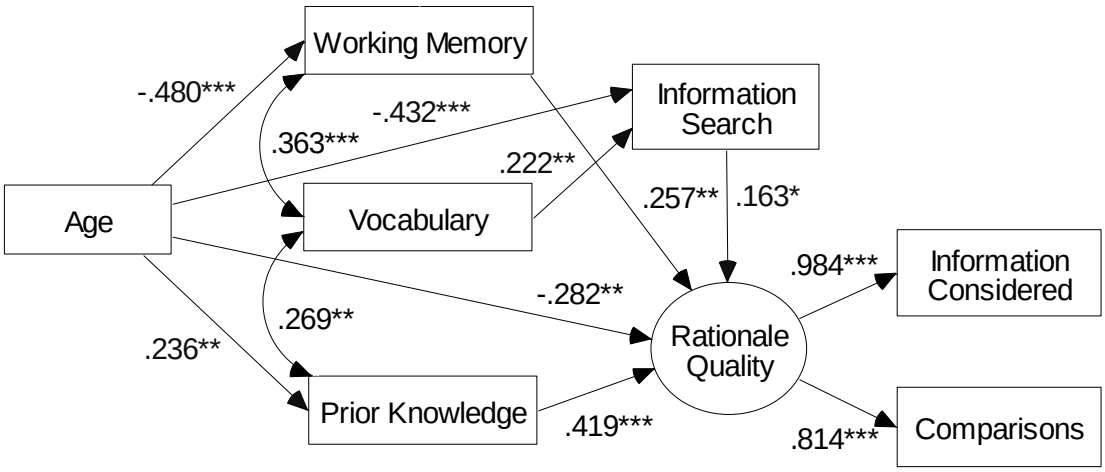

Figure 7. Path Coefficients for Optimized Model Including Age, Vocabulary, Working Memory, Prior Knowledge, and Information Search Predicting the Latent Variable Rationale Quality

$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

Table 5.

Direct, Indirect, Total Effects, and R^2 for the Optimized General Causal Model

Path	Direct	Indirect	Total	R^2
To Working Memory from				.23
Age	-.48	--	-.48	
To Prior Knowledge from				.06
Age	.24	--	.24	
To Information Search from				.24
Age	-.43	--	-.43	
Vocabulary	.22	--	.22	
To Quality of Decision Rationale from				.39
Age	-.28	-.10[a]	-.39	
via Information Search		-.07[b]		
via Working Memory		-.13**		
via Prior Knowledge		.10*		
Vocabulary		.04	.04	
Information Search	.16	--	.17	
Working Memory	.26	--	.26	
Prior Knowledge	.42	--	.43	

Note: All direct effects are significant at $p < .05$ or greater.

[a]No significance test for cumulative indirect effects is provided in AMOS 5.0. [b]$p = .064$

*$p < .05$, **$p < .01$

decision rationale directly as well as through decreased working memory and decreased information search. However, the accumulation of knowledge concomitant with increased age served to bolster rationale quality (see the paths between age and prior knowledge and prior knowledge and rationale quality in Figure 7).

Effects of Age and Education on Channel Preference

In order to examine the effects of age and education on channel preference, proportion scores were created to represent the degree of reliance on each type of resource (e.g., lay resources, organization resources, video resources, etc.). To do this the number of accessed resources of a particular type was divided by the total number of resources that participant used. Data from three participants who sought no information were excluded from these analyses.

It was hypothesized that increased age was associated with an increased reliance on lay resources. Lay resources include such things as family, friends, and mass media. The current data provided evidence in support of this age effect. Specifically, the proportion of lay resources used during the task was significantly correlated with age ($r(114) = .191$, $p < .05$, $r^2 = .037$).

Education was hypothesized to be negatively associated with a reliance on video resources and positively associated with a reliance on information from organizations. However, no supporting evidence for these hypothesized relationships were found (education and video: $r = .041$, $p > .05$; education and organization resources: $r = -.035$, $p > .05$).

Exploratory Analyses of Channel Preference

The media in which information is presented was thought to affect its appeal to men with different characteristics. An exploratory examination of the effects of the variables in the general causal model on media preference was conducted. Separate multiple regression analyses were conducted for the proportion of video and print media

utilized in the health decision-making task. A significant regression equation was found for the reliance on print media (R = .385, F(3, 110) p < .001, R^2 = .148). Information search (β = -.226, p < .05), vocabulary (β = .248, p < .05), and prior knowledge (β = -.195, p < .05) were included in the regression equation. Those who sought more information, had less prior knowledge, and had higher vocabulary skills were more likely to select a written document that they could hold in their hands, as opposed to reading on the computer screen. The regression for video reliance produced no significant predictors.

In addition to the media in which information is presented, channel preference can be defined as the source from which the information comes. Separate multiple regression analyses were conducted to examine relationships between the model variables and reliance on lay and organization resources. The analysis for lay resources indicated that information search (β = -.331, p < .001) was the only significant predictor of the reliance on lay resources (R = -.331, t(112) = -3.72). Those who sought less information relied on lay resources more than did those who sought more information. In regards to the age effect on preference for lay resources discussed earlier, it appeared that age effects were completely mediated by information search (see Figure 8). Older men tended to minimize their information search and, therefore, relied more heavily on lay resources. There were no significant predictors of reliance on organization resources.

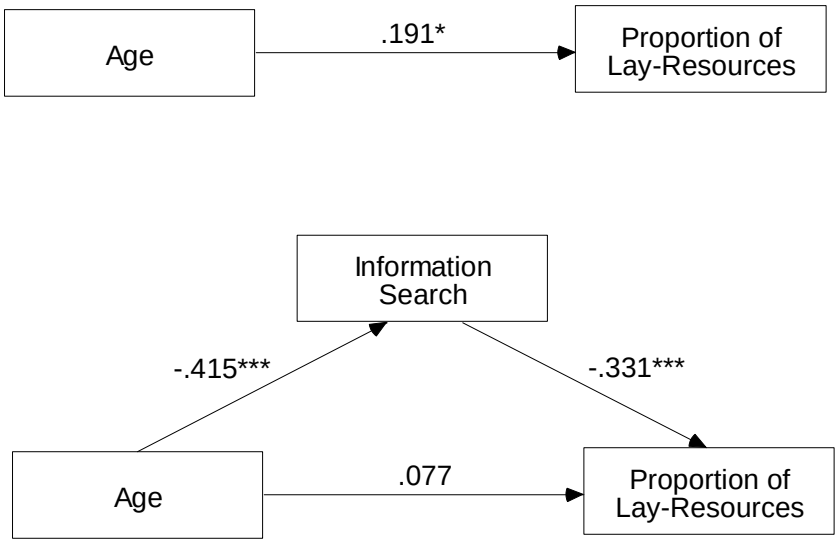

Figure 8. Information Search Mediating Age Effects on the Reliance on Lay-Resources.

DISCUSSION

OVERVIEW OF MAJOR FINDINGS

The primary purposes of this research were to replicate the finding that age influenced information search and to investigate variables that could account for these age effects. Johnson and others (Johnson, 1990; 1993; Pierce, 1993; Sinnott, 1989; Streufert et al., 1990) have found that age is associated with the amount of information sought during decision-making tasks. The current data extends this finding into the field of prostate cancer decision-making. In addition, predicted associations between information search, working memory, vocabulary, and decision-making were supported. In general, greater cognitive resources and greater desire to play an active role in making medical decisions predicted greater levels of information search on which to base a treatment decision.

Age was found to have a significant negative influence on the amount of information men sought. This held true even when controlling for the effects of decreased working memory, decreased desire for control in medical decision-making, increased prior knowledge and vocabulary. Age and vocabulary were found to be unrelated in the present sample. However, together they accounted for a large amount of the differences between the amounts of information men sought when preparing to make a medical decision. In addition, it was found that age and vocabulary served to counter each other's effects on information search behavior. That is, while increased age led to decreased amounts of information gathering, increased vocabulary bolstered men's ability to gather more information.

The quality of the rationale men provided for their decisions was found to be related to their age, vocabulary, working memory resources, prior knowledge, and the amount of information sought during the decision-making process. Increased age led to decreased quality while increased vocabulary, working memory, prior knowledge and information search led to increased quality. The findings also supported the hypothesized model that depicts greater vocabulary and greater information search leading to greater quality of decision rationale. Including age with these two variables significantly added to the ability to predict how well men would support their judgments.

While this model was able to predict differences in the quality of decision rationales, an even more robust model including age, working memory resources, prior knowledge, and information search was discovered. Increased age was found to both directly lead to lowered rationale quality and indirectly lead to lowered quality through decreased working memory resources and decreased information search. Older men were found to have fewer working memory resources. In turn, these lowered resource levels prohibited these men from developing high quality rationales for the decisions they made. Likewise, older men tended to seek out less information on which to base decisions. This reduction in information search led to a reduction in rationale quality.

At the same time, increased age predicted increased prior knowledge about cancer diagnosis and treatment. With greater prior knowledge men were able to produce better rationales for their decisions. This complex competition reveals that age helped men process decision-making situations through their increased knowledge. However, this small amount of aid was eclipsed by the multifaceted decreases in quality brought on directly or indirectly by the aging process.

Age was also found to influence the types of information men would rely on during the decision process. Older men were found to prefer information coming from friends, family, and other lay resources. This relationship was found to be entirely attributable to the amount of information these older men sought. In other words, older men tended to seek out less information, which created a greater dependency on what little information they sought. In this case, that information tended to come from lay resources.

All men were found to equally prefer information presented in video form; however, print media was not so equally regarded. Men who sought more information, had less prior knowledge, and had higher vocabulary were more likely to prefer resources in print. It appears that when men had the need and cognitive resources to seek more information, they more often chose to utilize written brochures and pamphlets.

FINDINGS REGARDING THE HYPOTHESIZED GENERAL CAUSAL MODEL

Age Effects on Working Memory, Vocabulary, Decision-Making, and Prior Knowledge

As adults age, many of their cognitive resources change. The current investigation replicates common age-associated declines in working memory resources and age-associated increases in knowledge of issues relevant to older adults, such as diagnosis and treatment of cancer. Also supported in this research is the link between increased age and a heightened desire to play a more passive role in medical decision-making (Degner & Sloan, 1992; Sutherland et al., 1989).

Vocabulary was predicted to be positively correlated with age; however, no such relationship was found. Schaie and colleagues (Schaie, 1994; Shaie & Willis, 1993) have found that certain measures of verbal ability tend to increase through middle age and then show some decline in the 70's and 80's. This is consistent with the current data. Vocabulary scores were found to peak with men in their 50's and decline into late life. Zwahr et al. (1999) also reports no age differences in verbal ability for their sample of 120 women between the ages of 20 and 79. The reasons for the current findings regarding age and vocabulary could be due to educational differences. The education levels of the men participating in the study are negatively correlated with age (r = -.182, p = .05). These differences in education in large part account for the lack of age related differences in verbal ability. When the effects of education on verbal ability are removed, the relationship between age and vocabulary approaches significance (r (114) = .162, p = .083).

Indirect Age Effects on Decision-Making Through Vocabulary and Prior Knowledge. Three variables were anticipated to predict participants' desire for control in medical decision-making: age, vocabulary, and prior knowledge. Increased age was found to predict the preference for a passive role in health decision-making, thereby replicating earlier findings (Deber et al., 1996; Degner & Sloan, 1992; Ende et al., 1989). However, the relationship between prior knowledge and control preference was not supported. Earlier research by Deber et al. (1996) found that prior experience with the health conditions described in the scenarios of their preference scale increased the likelihood that decision-makers would want to retain control of the decision process. The present research hypothesized that this experience could be represented in some form by

the amount of knowledge that participants had about the particular topic. However, there was no relationship found between prior knowledge and control preference. It could be that the mechanism by which experience affects decision-making is not through a general increase in knowledge. Rather it increases the patient's understanding of the specific effects of the treatment option chosen and therefore results in a commitment to a particular course of action. If patients believe that one manner of treatment is more or less effective, they might want to maintain more control so as to insure that option is secured or avoided. The prior knowledge data used in this study did not focus on this potential effect.

Another possible explanation could be that the scale measuring control preferences is too general. Perhaps decision control is more tied to specific disease states. This seems to be supported by the fact that individuals are sensitive to the severity of the different situations in the scale. Respondents are less likely to prefer an active decision-making role in a "mortality" situation than they are in a "quality of life" situation (Deber et al., 1996). This sensitivity may extend beyond these distinctions and may flow into distinctions between various diseases that equally reflect mortality concerns. In this case, a general preference for control aggregated across three situations unrelated to the present decision task might not provide a true indicator of preference.

Vocabulary was also predicted to influence the degree to which decision-makers desired control in decision-making. This hypothesis was only partially supported. By itself, vocabulary is not significantly associated with control preference. However, when the effects of age were held constant, differences in vocabulary significantly predicted the level of control participants desired. The effects of age mask the relationship between

vocabulary and decision-making preference. These findings were consistent with those reported by Deber et al. (1996) in which level of education predicted the degree to which participants desired more control in the decision process. It may be that education affects decision control process through it increase of cognitive resources such as knowledge of the world and verbal ability. The hypotheses that age would indirectly affect decision-making through its influence on vocabulary and prior knowledge were not supported.

Predictors of Information Search

The individual hypotheses for the relationships between information search and working memory, vocabulary, and preference for control in medical decision-making were supported. That is, increases in each were related to increased information search. Unlike predictions, however, men's level of knowledge about cancer diagnostic and treatment methods was not related to the amount of information they chose to seek during the decision-task. The underpinnings of this finding are not clear. It appeared that participants were using other factors to determine the degree to which they needed to seek information, such as working memory resources and verbal ability. This finding was consistent with a cognitive conservation theory that anticipates decision-makers to decrease the amount of taxing work in the face of decreased abilities to handle the task. While this theory is most dominantly used as an explanation of age-related changes in cognitive capacity, it provides a framework for understanding general differences across the lifespan.

In addition to working memory, vocabulary, decision-making, and prior knowledge, two interaction variables were predicted to affect the amount of information men sought. Meyer and Rice (1983, 1989) found that increased vocabulary enabled older

adults to maintain their ability to learn from text in spite of lower working memory resources. The present study hypothesized that this effect would also be seen in the moderation of working memory's impact on information search: which has at its core the processing of information from various textual and non-textual sources. This interaction was not found. However, there was support for the hypothesis that the age-related reductions in information search were lessened by increased vocabulary. Verbal ability allowed decision-makers to more easily process information, thereby making it possible to gather more information without being overwhelmed. This increased cognitive resource partly compensated for reductions in other resources. So while, vocabulary did not seem to alter the direct impact of working memory on information search, it did appear to decrease the ability of working memory and other age-related changes to negatively impact information search.

A similar effect can be seen for the impact of prior knowledge on information search behavior. Prior knowledge was predicted to interact with working memory in accounting for differences in information search. Increased prior knowledge has been shown to reduce reliance on working memory resources (Ericsson & Kintsch, 1995; Kaakinen et al., 2003). However, no such interaction was found. This effect could be a product of not reaching a threshold in knowledge that allows the learner to alter their reliance on working memory. Ericsson and Kintsch noted the need for high levels of domain knowledge in order for this shift to occur. None of the participants demonstrated expertise on the subject of cancer diagnosis and treatment.

Despite the lack of interaction effects, there was evidence that greater prior knowledge helped ward off the impact of other age-related changes. As seen with vocabulary, the presence of prior knowledge bolstered the information gathering process.

These findings, therefore, revealed a lack of support for the interactions between working memory and the two moderator variables. At the same time, there was support for the hypotheses that vocabulary and prior knowledge opposed the negative effects of age on information search.

When determining if these variables could take the place of age in predicting how likely men are to seek information, it was found that they could not. Age still accounted for a significant amount of unique variance in information search beyond that accounted for by working memory, vocabulary, prior knowledge and the desire for control in health decision-making. As seen above, controlling for vocabulary and prior knowledge actually increased the predictive nature of age on information search. There was a trend for working memory to mediate age effects on information search when considered by itself. However, when all four mediating variables were considered in unison, vocabulary was the only variable that added significantly to the prediction of information search.

Part of the explanation for this finding was in the relatedness of the variables in the model. There was a high degree of multicolinearity between age, working memory, vocabulary, and prior knowledge. These relationships were not random. That is, since both the working memory and prior knowledge tasks were verbal, the fact that there were correlations between them was not surprising. However, the variables were believed to be testing constructs different enough to tap different aspects of the aging process. This belief, however, appeared not to be substantiated in this research. The result was a model

in which only vocabulary and age significantly added to the prediction of information search behavior. Instead of explaining how the direct effects of age on information search can be lessened, the data indicate that the direct effects have already been lessened by the effects of vocabulary on information search. Both vocabulary and age may give physicians insight into the information needs of their patients.

Predictors of Quality of Decision Rationale

Meyer et al. (1995) and Zwahr et al. (1999) found that older women produced decision rationales that were inferior in quality to those created by younger women. This inferiority included overall quality as well as specific aspects of the rationale such as the number of causal and comparison statements. The present study replicated these findings in a sample of men making a hypothetical treatment decision for prostate cancer. Older men were found to produce rationale statements that reflected the consideration of fewer pieces of information and contained fewer comparisons between ideas and options.

In addition, it was predicted that increases in vocabulary and the amount of information sought during the decision process would significantly predict increases in the quality of rationales generated by participants. Both effects were supported in this study. Participants who had more verbal ability were better at producing rationales for their decision. This effect reflects similar findings by Zwahr et al.(1999). In addition, increased information search predicted increased quality of decision rationales. Men who gathered more information included greater amounts of it when giving justification for their actions.

The test of mediated age effects predicted by the general causal model indicated that some of the hypothesized relationships were supported. Both vocabulary and

information search accounted for significant variance in rationale quality. The age effects, however, were not fully mediated. Rather age indirectly affected rationale quality through decreased information search in addition to having directly affected it. Vocabulary again acted as a reciprocal suppressor to age, thereby increasing the direct effects of both.

Again the present research has been unable to show a full mediation of age effects: this time on the quality of participants' decision rationales. An exploration into the effects of working memory, prior knowledge and preference for control in decision-making aided in the creation of a more robust picture of how age affected rationale quality. While working memory was hypothesized to affect decision quality only indirectly, by limiting the amount of information sought, there was evidence which suggests a direct effect.

Park (1999) noted that health decision-making is a resource intensive process. Decision-makers have to simultaneously consider different sources of information with varying opinions, different probabilities of success for different options, and differing preferences for the potential outcomes. As such, working memory should play a critical role in the gathering and processing of this information. The data from this study showed that limited working memory significantly predicted the generation of decision rationales with fewer pieces of information and fewer comparison statements. In addition, these findings held true even when controlling for the effects of information search, age and prior knowledge. So, while working memory was not found to significantly mediate age effects on information search, it did mediate age effects on quality of decision rationale.

Prior knowledge also played a larger role in the prediction of rationale quality than was hypothesized. Instead of indirectly affecting quality through increased information search, prior knowledge directly affected the quality of decision rationale. This indicated that decision-makers were utilizing two sources of information to justify their choice of treatments: prior knowledge and newly acquired knowledge. The effects of these two sets of information appeared to be acting independently, as the relationships between each and rationale quality were significant when holding constant the effects of the other knowledge.

Overall, the direct effects of age on rationale quality were not fully mediated. However, it was evident that age worked through changes in working memory, information search, and prior knowledge to influence the quality of men's reasons for selecting a treatment option. In addition, verbal ability enabled decision-makers to generate better rationale by facilitating greater information search. Zwahr et al. (1999) hypothesized that cognitive abilities, such as working memory and processing speed, indirectly affected quality of decision rationale through verbal abilities, such as vocabulary and reading comprehension. The present data revealed a significant relationship between vocabulary and working memory ($\beta = .36$), which would lend support to this hypothesis. However, the lack of a direct effect for vocabulary on rationale quality indicated a failure to replicate their results.

Channel Preference

Consistent with the findings of Johnson and Meischke (1992a, 1993; Meischke & Johnson, 1995) age was significantly correlated with a reliance on information from lay resources. Older men tended to more heavily rely on lay resources for their information.

In addition, these age effects appeared to result from less information search. That is, when the effects of information search were held constant, age no longer predicted a preference for lay resources. This reflected a type of cognitive conservation in that older adults sought to limit their exposure to information. They most often turned to the sources that were least taxing to obtain and with which they were most comfortable, such as friends and family.

Greater reliance on lay-resources could also be a product of greater experience within their circle of friends. Johnson and Meischke (1993) found that decision-makers more often sought counsel from friends and family when this social network consisted of people who had undergone cancer treatment. Some support for this interpretation was found in the data. The data indicated that when the effect of prior knowledge on preference for lay resources was held constant age was no longer significantly related to this preference.

Education was not found to relate to a reliance on video resources. While this finding is consistent with some extant literature (James et al., 1999), the lack of support for this hypothesis may reflect the methodology of the research rather than on the relationship between education and use of video for cancer information. Meischke and Johnson (1995) found, in a sample of 317 women, that those with less education reported getting a greater amount of information from television. The present research did not replicate the degree to which television was utilized by people in their everyday lives. Instead, the television was represented by videos that were more reputable than what might appear on TV programming. This could have altered the degree to which more educated men perceived the usefulness of this information source. Therefore, this

research does not rule out the possibility that true differences in preference for naturally occurring television programming may exist between poorly educated and well-educated men.

From a different prospective, however, the video was believed to provide a less taxing means of information conveyance than reading an article. As a result, it was hypothesized that the less educated would prefer it. This hypothesis was not supported. Interestingly, it was found that verbal ability, in addition to prior knowledge and information search, was related to the use of print media. Those with more verbal ability, less knowledge, but with a desire to seek out information were more likely to utilize brochures and pamphlets. Age was negatively correlated with reliance on print media; however, its effects are fully mediated by prior knowledge and information search. So while everyone utilized videos equally, those with greater verbal and prior knowledge resources more often sought out print media This finding was not expected.

Print media was anticipated to be more accepted by older adults. It is a medium with which they have more experience, compared to electronic media. The decision task was set up so that the urologist provided the decision-maker with a handout and brochure. However, it appeared as though these resources were not perceived as readily available. In the real world, it is very easy to read something that is given to you by a physician. The lack of being physically handed the information may have led to a belief that it would take too much effort to go find the material on the board located by the computer. This may not seem reasonable, but when compared to simply clicking a link on the computer and having instant access to information, having to locate a piece of printed material among a group of numbered envelopes takes up more time. This may be why

those who had the energy and wanted to know more about the options sought out the printed material.

Limitations of the Study

There are several characteristics of this study that threaten the degree to which its findings can be applied to decision-making by men actually facing this prostate cancer decision. The first concern regards the research design utilized in the study. A cross-sectional design allows for a snapshot of how men of different ages engage in the medical decision-making process; however, it is not able to rule out the possibility of cohort effects. That is, there may be significant differences between men at different ages beyond those accounted for in this study. While changes in cognitive processes, verbal abilities, prior knowledge, and desire for active participation in medical decision-making are important factors, it may be that generational differences in society's approach to this type of task influence men's information seeking behavior even more. In order to gain better insight into changes in decision-making approaches, longitudinal research should be undertaken. Tracking men as their resources and knowledge change with increasing age would provide better insight into the effects of age. In doing this, it can be determined if the effects in this study are or are not a product of cohort effects.

Of particular concern when considering possible cohort effects in this research, are the participants' perception of risk, relevance, and trust of physicians. It may be that including young men, regardless of their cohort, in research on prostate cancer is meaningless. Because men under 50 rarely have to deal with the disease, their perception of risk and relevance may be significantly lower than older men. The present research did not measure perception of risk; however, the participants were asked about their

perceptions of the relevance of prostate cancer to their own lives. Relevance was found to be significantly related to age ($r = .228$, $p < .05$), however it was not significantly correlated with information search behavior or decision rationale quality. Still, it remains important for research to account for these differences in the applicability of the disease state to the various men being studied. Finally, trust of physicians is an important component in the process of making a medical decision. The increased number of controversies about medical procedures, especially in cases where physicians disagree about the best treatment approach, seems to have created within younger adults a lowered reliance on physicians to have all of the answers for medical problems. This change in trust may account for the changes in information search behavior. Older adults simply trust their doctors more and therefore don't see a need to gather information about what is happening to them. Future research will need to better account for this possibility.

Another limitation to this research is that the participants involved in the study were not randomly selected. Instead, these men were volunteers who were actively recruited and paid for their participation in the study. As a result, these men might have different levels of motivation for completing the task than would a fully random sample of men. They may also represent a more educated group of men than would be found in the general population. The average education for all men was 15 years and for the oldest group (73 – 87 years old) it was 13. For the men in their 40's the average was beyond an undergraduate degree. This education level might lead these men to behave differently than would a sample of less educated men.

The men were also not actual patients making a medical decision. The use of hypothetical tasks brings with it specific issues of motivation and emotional response.

While some of the men had undergone prostate cancer treatment, none of the men were currently facing this medical situation. Since there were no real consequences for making a poor decision in this task, men may not have acted as they would were it really happening to them. In addition, being told one has cancer can be emotionally and psychologically devastating. A hypothetical task cannot evoke the types of responses that could occur in real life. In some instances, these responses might drive men to invest more into the process of decision-making, drive them to shut down and not engage at all in the process of decision-making, or anywhere in between. Even though the scenario was designed to be life-like, it could not replicate the real decision.

Another limitation in using a hypothetical task in a conscribed time frame is the inability to replicate the full time course that men would have in making this decision. Since prostate cancer is a slow-growing cancer, men typically have months to make a treatment decision. During this time, they would have time to seek much more information than was feasible in a 15 minute to one hour long hypothetical task. In addition, during that time men could locate many sources of information not included in this task. They would be able to speak with real cancer patients and ask the types of questions that you would only ask in private. The current scenario tried to replicate some of this interaction, but it was still a far way from the real world.

The inability to recreate all of the nuances of a doctor patient relationship is another drawback to the present study. The trust that often exists between doctor and patient is crucial when major medical decisions must be made. In addition, the underlying pressure to do what the physician wants you to do can lead men to act in ways that they would not otherwise act. Several men commented that they approached the task as if they

fully trusted the doctor. “If I didn’t,” one man commented, “then I would probably do something else.” It is not clear if all of the men participating in the study adopted the same approach.

Finally, within the information provided by the decision task, it was not possible to replicate all of the channels of information available to men. In fact, even the channels represented in the study, such as friends, family, second opinions, and medical journals, did not mimic the degree to which they are accessible by men in the real world. In fact, there was a concerted effort to create an optimal search environment. In this “perfect world” situation information costs only the energy it takes to click a button or pull a booklet out of an envelope. By making second opinions, Internet resources, medical journals, testimonies of cancer survivors, booklets and videos easily accessible, the individual decision maker’s desire for more information and ability to process it are the major factors influencing the amount of information utilized. This approach also reflects the current trend toward assisting patients to gain greater access to medical information (Barry, 2002; Wei & Uzzo, 2002). While this created a problem with external validity, it enabled the study to focus on what the men might like to see if they could easily get their hands on it.

The primary purpose of the research was to investigate overall information search behavior. Little attempt was made to systematically control the number of resources from various channels. Nor was there any attempt to insure that the different source channels were represented in similar locations throughout the decision task. That is, there was a greater proportion of some channel resources deeper in the structure of the decision task so that a participant would have had to investigate more thoroughly to access them. As a

result, the degree to which the study can assert that one channel of information is better than the others across all men is minimal. So, while it is not possible to say that lay resources are better than journals, it is possible to assert that older men were more likely to rely on lay resources than are young men.

In addition, an attempt was made to filter the information so that participants were not given misinformation about the state of prostate cancer treatments. Due to this desire to provide accurate information, some lay resources which may be more accessible to men in the real world were not represented in this research. Again, this threatens the applicability of the findings to other settings in which misleading information may be prevalent.

For all of the limitation, however, the study does provide information about how men with varying characteristics interact with a single situation. In medical decision-making, hypothetical scenarios are utilized, in part, because of the diversity of potential patient situations. For example, in prostate cancer treatment decisions, physicians typically use a patient's age, life expectancy (the presence of other conditions which may decrease survival), and clinical factors related to the cancer to make a treatment recommendation. However, if any one of these variables changes while the other two remain constant, the treatment recommendation may change (Krahn et al., 2002). As a result, it is very difficult to compare the information search behaviors of men across such different situations. The ability to standardize the prostate cancer scenario allowed for a more isolated investigation of decision-maker characteristics.

Implications for Health Care Workers

The goal of this research is to provide insight into how health care workers can better anticipate and meet the needs of their patients. Much emphasis has been placed on knowing how much of a role patients desire to play in the decision-making process (Degner & Sloan, 1992; Deber, Kraetschmer, & Irvine, 1996). However, the present data indicate that the desire to play a role in decision-making is not the best predictor of the amount of information men want during the decision process. While this finding is not new (see Hack et al, 1994), it stands to be repeated. Men who may not want the responsibility of making the final decision, may still want to know what is going on and, perhaps, even more.

For this reason, health care workers need to be cognizant of other variables that affect the degree to which men may want information. The principle variables found in this study were age and vocabulary. By knowing the importance of these variables, educational interventions can be geared for particular men. Simply knowing how much information to provide can facilitate a healthy decision-making situation. A situation in which men feel informed and empowered to be part of the process, without being overwhelmed by too much information or frustrated with a lack of resources.

This study also found that men of all ages utilize videos if they are viewed as reputable. The ease with which information can be gathered from videos can be an asset to patients during this time of potential stress. The difficulty, however, is the need to find videos which are up-to-date. The videos utilized in this research were from 10 years to 3-years-old. While they still contained valid explanations for basic procedures, they did not

have current probability information regarding the likelihood of side effects. As a result, it may be hard for a physician to keep a good video library of decision aids.

Prior knowledge was shown to be very influential in the decision-making process. Steginga et al. (2002) found that much of the prior knowledge being used by men to make prostate-cancer decisions was from people with other types of cancer. It is important for physicians to be aware of this potential. Prostate cancer decisions do not have the same clinical expectations that breast cancer or other forms of cancer have. The growth rates and likelihood of killing the patient differ across disease location. Most people are not aware of this and therefore may be making faulty decision. If health-care professionals are aware of the types of knowledge men have, they will be better prepared to discuss the similarities and difference between the experiences men know about and the one they are currently in. This will better equip men with the information they need to make informed decisions.

Future Research

The present research has revealed several areas of research for future investigation. First is the area of preferences for control in medical decision-making. More research needs to be done to gain a better understanding of what factors contribute to a patient's desire for inclusion in the decision process. This study found that prior knowledge was not related to decision role preference; however other research (Deber et al., 1996) found that greater experience relates to greater control preference. The relationship between experience and knowledge is not clear. Future research could be aimed at investigating whether the presence of resolute ideas regarding treatment effectiveness is the main mechanism by which experience drives control preference.

In addition, the lack of consistent effects of control preference on information search behavior deserves attention. Research focusing on the distinctions between generalized control preference and control preference for a specific situation may shed light on the amount of information men seek. It could be that a desire to take part in the current decision better reflects information search desire than does a general approach to making medical decisions.

Along the same lines, the addition of variables tapping the desire for information more directly could provide a more complete picture of what men do during decision-making tasks. Miller (1987) created a scale measuring cognitive styles geared around information seeking and information avoiding. The Need for Cognition Scale (Cacioppo, Petty & Kao, 1984) might also aid in predicting information search. These and other measures should be included in future investigations of patient information search behavior.

The failure of prior knowledge to predict information search has led to questions regarding the nature of the relationship between the two variables. Perhaps the relationship is more curvilinear than linear, with information search being least in men with either very minimal or very substantial prior knowledge. An investigation into this relationship would provide added insight into decision-making processes. In fact, insight can be gained from research which tracks information search changes across lengthy disease states. It may be that even old adults who grow accustomed to interactions with physicians regarding a particular ailment will begin to question the doctors more and desire more information about their options. Again, information search may be reduced once the patient reaches a knowledge plateau. Research dedicated to the nature of this

relationship between prior knowledge or experience and information search would greatly contribute to an understanding of medical decision-making. Physicians' awareness of the changing needs of patients could lead to greater patient satisfaction with their treatment choice and, perhaps, better compliance with treatment regimens.

Finally, the real test for the findings of the present study will be their applicability to actual patients. A study which implements a patient education program for men recently diagnosed with prostate cancer should be conducted. This program could be geared around each patient and act as an information support system to aid the patient in finding the information he desires. In addition, patients' diaries could be utilized to track the types of information they seek on their own. In such a study it will be possible to distinguish between information gathered for various purposes such as emotional coping, social support, and decision-making. Data regarding types of information, where they get it, when they get it, and for what purposes they get it can give physicians insight into what patients desire most. As a result, health-care professionals can be enabled to better meet the variety of patient needs.

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APPENDIX A

The Presentation Order of Materials

Consent Form

Background Questionnaire / Interview

Computer Tutorial

Prostate Health Decision Task

Decision Rationale Questionnaire

Decision Rationale Verbal Protocol

Reading Span Test

Break

Quick Word Test

Problem-Solving Decision-Making Scale

Debriefing materials

APPENDIX B

Background Questionnaire

1) Date of Birth: __/__/___ 2) Age: _____ 3) Gender: _____

4) Years of Education Completed (Circle the highest year completed. Use the verbal descriptions to help you chose which number to circle):

3 4 5	6 7 8	9 10 11 12	13 14 15 16	17 18	19 20+
Elem.	Middle School	GED or School	Bachelors High School	Masters	Doctorate

5) Health Status (Circle one): Excellent Good Fair Poor

6) Were you, are you, or are you training to be a medical health care professional? (nurse, doctor, physician's assistant, medical researcher, etc.). (Circle one): Yes No

If you circled "Yes" please specify _____

_____

7) When learning information, do you prefer listening to a single speaker or a debate?

8) Average frequency of Internet use, not including email (Circle one):

At least Once a day	At least once a week	At least once every two weeks	At least once a month	Less than once a month

9) Average number of hours per week spent on computers (any application): _____

APPENDIX C

Prior Knowledge Questionnaire—Verbal Form

1) Please tell us what you know about prostate cancer. (for example, what it is, risk factors, diagnostic tools, treatment options, treatment side effects, etc.)

2) Have you, a relative or someone else you know been diagnosed or treated for prostate cancer? If so, please tell us what you know about this person's experience (their treatment choice, progression of the disease, side effects, current state of the cancer, etc.). If you know more than one person, please include as much information as you can about the two or three most meaningful to you.

---

3) Please tell us what you know about other types of cancer. (for example, what it is, risk factors, diagnostic tools, treatment options, treatment side effects, etc.)

4) Have you, a relative or someone else you know been diagnosed or treated for other types of cancer? If so, please tell us what you know about this person's experience (their treatment choice, progression of the disease, side effects, current state of the cancer, etc.). If you know more than one person, please include as much information as you can about the two or three most meaningful to you.

APPENDIX D

QUICK WORD TEST

Directions: Circle the word that means the same as the first word after each number. If you do not know, GUESS. Work quickly. Answer all the questions.

Sample: Happy = dull seem (glad) fast

1. edict	=	fiat	talk	root	oust	26. queue	=	what	mane	line	shop
2. genre	=	peer	waft	sort	norm	27. stead	=	foal	rely	lieu	bear
3. trawl	=	boat	fish	cape	sing	28. whine	=	pule	coil	beer	weir
4. heart	=	beat	draw	core	vein	29. crawl	=	riot	knee	skin	inch
5. taint	=	deny	spot	fill	fall	30. swirl	=	tide	eddy	rise	swim
6. topic	=	text	wide	term	book	31. natty	=	bold	blue	flay	trim
7. niter	=	soda	late	bomb	show	32. shape	=	neat	chap	cote	tool
8. helot	=	rise	hail	evil	serf	33. hutch	=	nest	coop	hold	snag
9. girth	=	wide	band	awry	glee	34. crisp	=	dare	firm	snap	code
10. hokum	=	clod	lout	bunk	doze	35. elide	=	dash	trod	omit	skim
11. levee	=	raze	lift	flat	dike	36. flair	=	lair	dare	bent	game
12. force	=	cope	grit	dint	wade	37. angle	=	fish	rage	ring	line
13. stern	=	rear	glum	rage	shop	38. small	=	mean	pint	meek	safe
14. butte	=	goat	goad	soft	hill	39. glaze	=	lens	look	pane	coat
15. suave	=	leak	prig	oily	lean	40. sober	=	wash	side	weep	cool
16. sully	=	soil	deny	brag	cart	41. crook	=	jail	lout	deal	bend
17. thick	=	dull	illy	ruse	rube	42. ember	=	heat	glow	coal	seem
18. abyss	=	rule	duet	urge	gulf	43. facet	=	pain	side	turn	easy
19. crack	=	high	chap	file	cake	44. usurp	=	grab	slop	glut	sate
20. eject	=	oust	emit	cart	rush	45. covet	=	envy	rill	coat	vest
21. taper	=	leer	wick	worm	bind	46. shaft	=	pole	deep	high	move
22. shoot	=	bang	push	twig	jump	47. algid	=	damp	weed	cold	moss
23. storm	=	wild	wash	rend	rave	48. parry	=	wear	hunt	bear	fend
24. fatal	=	dire	evil	omen	wish	49. dowry	=	acid	gift	wife	grin
25. foray	=	food	wood	take	raid	50. awful	=	dire	load	fear	vast

QUICK WORD TEST (continued)

51.	omega	=	dose	last	salt	lens	76.	opine	=	tree	deem	pick	drug
52.	barge	=	vast	bark	pull	abet	77.	reign	=	stem	fall	sway	ride
53.	whorl	=	coil	bell	spin	rite	78.	rough	=	rude	wave	hard	deep
54.	grove	=	cava	wane	wood	hole	79.	vogue	=	good	nice	hazy	mode
55.	snare	=	bark	trap	leer	sulk	80.	chuck	=	wood	toss	bade	trim
56.	trick	=	loft	send	joke	ruse	81.	taunt	=	lean	send	twit	scat
57.	quirt	=	emit	bend	whip	bale	82.	clasp	=	hand	sort	game	hasp
58.	debar	=	wood	mine	tabu	help	83.	heady	=	vast	rash	shod	firm
59.	feign	=	sway	sham	rule	glad	84.	valid	=	deed	cold	just	weak
60.	chest	=	hope	case	lung	dump	85.	flout	=	hurt	fool	drop	jeer
61.	elate	=	only	life	flew	lack	86.	canon	=	shot	rule	ball	soon
62.	sward	=	dirk	turf	fend	hive	87.	smoke	=	fire	heat	blow	reek
63.	irate	=	rant	lift	ired	like	88.	brace	=	pair	rash	clap	hard
64.	trunk	=	sack	body	bunk	rant	89.	chump	=	mate	drag	dolt	bump
65.	order	=	send	beat	cash	rank	90.	adorn	=	gilt	gold	gild	barb
66.	chafe	=	fret	cook	hilt	dish	91.	avast	=	heap	huge	hole	stop
67.	argot	=	gold	drug	peak	cant	92.	craft	=	wile	rank	sail	tool
68.	inane	=	loco	pert	void	wise	93.	thick	=	whit	nick	knew	muse
69.	alter	=	self	mind	vary	wend	94.	cheer	=	good	bode	lift	send
70.	salve	=	salt	ease	seek	work	95.	caper	=	romp	wrap	game	roll
71.	allot	=	lend	mete	wear	much	96.	harry	=	raid	male	join	wait
72.	bully	=	hard	haul	fine	evil	97.	trust	=	oral	pool	hold	file
73.	ardor	=	zeal	iron	gilt	vine	98.	exude	=	oust	lead	rule	ooze
74.	crown	=	hair	brag	hail	pate	99.	hovel	=	shed	tool	rare	want
75.	flock	=	tame	game	coat	bevy	100.	stuff	=	cram	junk	hard	lout

APPENDIX E

Problem-Solving Decision-Making Scale (PSDM; Deber, Kraetschmer & Irvine, 1996)

In this section, 3 medical conditions are described. Each condition is followed by some statements related to making decisions. Please CIRCLE the number which best indicates how you would feel about each statement if you actually had the medical condition which is described. Remember, there are no RIGHT or WRONG answers. We are interested only in your opinions.

1. Suppose you often experience a burning sensation when you go to the bathroom. You usually have to push to begin to urinate and sometimes dribbling occurs after urination.
(Circle one number for each question.)

	Doctor Alone	**Mostly the Doctor**	**Doctor and You Equally**	**Mostly You**	**You Alone**
a. Who should determine (diagnose) what the likely causes of your symptoms are?	1	2	3	4	5
b. Who should determine what the treatment options are?	1	2	3	4	5
c. Who should determine what the risks and benefits for each treatment option are?	1	2	3	4	5
d. Who should determine how likely each of these risks and benefits are to happen?	1	2	3	4	5
e. Given the risks and benefits of these possible treatments, who should decide how acceptable those risks and benefits are for you?	1	2	3	4	5
f. Given all of the information about risks and benefits of the possible treatments, who should decide which treatment option should be selected?	1	2	3	4	5

How much experience have you had with the clinical situation described in the above scenario? (Please circle all letters that apply)

a. I have had personal experience with it.
b. I know of family members or close friends who have experienced it.
c. I have read about it.
d. I do not know much about it.

2. Suppose you had mind chest pains for 3 days and decided that you should visit your doctor about this. (Circle one number for each question.)

	Doctor Alone	Mostly the Doctor	Doctor and You Equally	Mostly You	You Alone
a. Who should determine (diagnose) what the likely causes of your symptoms are?	1	2	3	4	5
b. Who should determine what the treatment options are?	1	2	3	4	5
c. Who should determine what the risks and benefits for each treatment option are?	1	2	3	4	5
d. Who should determine how likely each of these risks and benefits are to happen?	1	2	3	4	5
e. Given the risks and benefits of these possible how acceptable treatments, who should decide those risks and benefits are for you?	1	2	3	4	5
f. Given all of the information about risks and benefits of the possible treatments, who should decide which treatment option should be selected?	1	2	3	4	5

How much experience have you had with the clinical situation described in the above scenario? (Please circle all letters that apply)

a. I have had personal experience with it.
b. I know of family members or close friends who have experienced it.
c. I have read about it.
d. I do not know much about it.

3. Suppose you and your partner have been trying for pregnancy, but have been unsuccessful for more than a year. (Circle one number for each question.)

	Doctor Alone	Mostly the Doctor	Doctor and You Equally	Mostly You	You Alone
a. Who should determine (diagnose) what the likely causes of your infertility are?	1	2	3	4	5
b. Who should determine what the treatment options are?	1	2	3	4	5
c. Who should determine what the risks and benefits for each treatment option are?	1	2	3	4	5
d. Who should determine how likely each of these risks and benefits are to happen?	1	2	3	4	5
e. Given the risks and benefits of these possible treatments, who should decide how acceptable those risks and benefits are for you?	1	2	3	4	5
f. Given all of the information about risks and benefits of the possible treatments, who should decide which treatment option should be selected?	1	2	3	4	5

How much experience have you had with the clinical situation described in the above scenario? (Please circle all letters that apply)

a. I have had personal experience with it.
b. I know of family members or close friends who have experienced it.
c. I have read about it.
d. I do not know much about it.

APPENDIX F

Computer Tutorial

Using Hyperlink Environments

What is a web page?

- A web page is like a piece of paper. It can be very small or very large. It can hold text, charts, pictures, or even movies (something a regular piece of paper can't do!). Some pages are too long to fit on the computer screen. In order to see all of the information, you often have to "scroll" down the page. Scrolling is another word for moving. To scroll up or down the page you can use one of two methods. First, there is a bar at the right-hand side of the screen. At the top and bottom are little arrows. If you put your mouse arrow on the top arrow and press down the left mouse button, you will scroll up the page. Pressing the button while on the bottom arrow lets you scroll down the screen. The second way you to move is to use the "scroll wheel" at the top-center of the mouse (that gray thing). The wheel can be rolled toward you or away from you. If you roll it away from you, you move up the screen. If you roll it toward you, you move down the screen. You'll have plenty of time to practice this skill as we continue. Now, back to web pages.

- Each page is a separate thing (thing is a technical term!). Since each page is separate, we need a way to move from one page to another. By making connections between pages, we create an environment that allows us to look at a lot of information with very little effort. We call a collection of pages that are connected together a "web." We call the connections between pages "hyperlinks."

What is a hyperlink?

- A hyperlink is almost always an underlined piece of text or an image.

- When moving the mouse arrow over a hyperlink the arrow will always turn into a hand. Right now, without pressing any buttons, use the mouse to move the arrow over this spot to change the arrow into a hand. Did you see the arrow turn into a pointing hand. This shows us that a hyperlink is present. If we want to investigate the link ("link" is short for "hyperlink") all you need to do is press the left mouse button ONCE. When you activate a link, we usually say you have "jumped" somewhere. The act of pressing the button is called "clicking." So if you are ever told to click on something, you are being asked to move your mouse over the object and press the left mouse button once.

- A hyperlink is used to jump to a specific place **within a web page** or **to another web page**.

- However, just because there is an opportunity to jump using a hyperlink doesn't mean we have to. Typically, hyperlinks provide more information about a particular concept or take the reader to a new topic depending on the context of the link. If you think the link is something you already know about, there is less reason to jump. If you jump too much, you may never finish reading the page you started on!

Hyperlink colors

- Hyperlinks change color after they are activated by clicking on them. This is done to show that you have already been where the link would take you. Hyperlinks are commonly blue. When you click on a hyperlink and then go back to the spot where it was, the color changes (most commonly to purple). This is very helpful when looking at a lot of information at one time. You can still use the purple link just as you would a blue link. The color just tells you that you have been there before.

Let's move down page to the next part of the tutorial. Remember, we can do this two ways. 1) Click the down arrow on the right hand side of the page, or 2) use the scroll wheel (the middle gray thing) on the mouse by rolling it towards you. We recommend that you use the scroll wheel, it makes life much easier!

Let's talk a little bit more about the two ways of jumping.

- 1 - Jumping **within a page** would be the same as going from the top to the bottom on the same page in a book. If we click on this type of hyperlink we stay on the same page, we just move to a different section.
    - Here's an example:

      (Scroll back down after you've made the jump!)
      Click here to go to the top of this page.

    - You will often see this type of link at the top of a very long page. It works like a table of contents in a book by allowing you to go directly to the section of the page you are interested in. One point should be made here; you don't have to use these links to access the information. This is because you would eventually see the information if you scrolled down far enough. After all, all of the

information is on ONE page! These links just make it easier to find the information quickly.

Now practice using the scroll bar at the right or your scroll wheel to move down to the second way to jump.

You made it! Let's look at #2.

- 2 - Jumping **to another web page** would be the same as going from one page to another. The great thing is that you don't have to waste time shuffling paper pages. Remember, each web page is separate. We use links to connect the pages together. In the example below, two different links are used to take you to the same place. It doesn't matter if you click the blue text or the "one way" sign. Both links will take you to a separate page that continues this tutorial. Right now you are at the bottom of this page. If you don't jump, you'll be stuck here.

Click here or click the arrow below to jump to the next page.

Congratulations!

You have made it through the hard part.

If you are NOT comfortable with how hyperlinks work click the "Start Hyperlink Tutorial Over" link below to navigate through the tutorial again.

Start Hyperlink Tutorial Over

Otherwise, we are going to practice your skills and give you a feel for the task you are about to do. So, if you feel comfortable using hyperlinks click the link below to continue.

Want to go to Barbados?

Is This Vacation For You?

To get you used to the procedures we will be using in the medical decision-making task, we have set up a little vacation decision. In this decision task we want you to get used to the types of information available to you and the ways you are able to use them. The three main types of information are print, electronic, and video. Practice your computer skills as you work through this short decision.

While you will be asked to make a decision, don't feel that you have to study any of the material. This part of the tutorial is just for fun, so don't get bogged down in all the information that is available to you. Read what you'd like and skim the rest!

For the rest of this tutorial we want you to pretend that a good friend has offered you a deal on a trip to Barbados. You were planning on going somewhere else, but you told him you would think about it.

Continue

Barbados!

Barbados is a Caribbean island. You can find out information about this island by viewing a number of different resources. Look around and see if this paradise is for you!

What would you like to do?

1) Read an recent article on Barbados

2) See part of the Barbados Tourism Encyclopedia web site (This site has differently colored hyperlinks. Look for the underlined words that are differently colored than the text they are with.)

3) Watch a video about Barbados

When you are ready to make your decision click here.

Do you want to go to Barbados?

Yes

No

Are You Ready To Start?

You have successfully finished the tutorial! Your computer skills are good and you are ready to start the main task. If you have any questions, please feel free to ask them.

You will now go to an introduction page for the medical decision-making task. It will explain the task and what you will need to do. Thank you for taking the time to be involved in this study. Your input is greatly appreciated!

Continue

APPENDIX G

Main Scenario Pages for the Prostate Health Decision Task

Welcome: Everybody's Different

Welcome to a research project designed to investigate how men make medical decisions. Over the next few minutes you will be asked to pretend you are someone experiencing a medical problem. You will then be asked to interact with this web-based tool to learn about and come to some conclusion regarding a treatment for your condition. Since everyone goes about making medical decisions in different ways, we would like to know how you would go about solving this dilemma in conjunction with a physician.

Be True To Your Way Of Doing Things!

There may be times in the study when we ask you what you would like to do. Instead of having you type in your answer, we have provided a few options. We want to know what you would really do in that situation, so if an option suggests something that you wouldn't naturally think of doing, don't do it. Try to be as true to your own personality and decision making style as possible.

Sometimes during the course of your unfolding medical scenario the options will involve consulting the physician or some other information source to find out more information about your condition or what you might do. Take as much or as little time as you need in order to make the best decision you can, the way you would normally make it. As with many medical decisions, the proper treatment varies according to the individual being treated and the exact components of the condition; therefore, there may be many "right" answers. The most important aspect of this task is for you to feel comfortable with the choices being made.

Keep Track Of Things

You have been given some paper to use throughout the decision task. Please feel free to take notes on any information you think is important. Some information you may not easily access again, so writing down important information when you get it will be helpful.

The Decision Task Format

The scenario is set within a hypertext environment so that you may access new information any time you see blue or purple underlined hyperlink. One of the beauties of hyperlinks is that you do not need to double click on them. Simply click once with the left mouse button and you will be taken to the corresponding page. If you are accustomed to "surfing," we ask that you not use the browser's navigation bar located at the top of the page. Instead, please use the navigation tools (hyperlinks) provided for you within each page. All pages have links at the bottom that you are instructed to click when you are finished with the information provided on the page. Following these links will enable you to access other information or other parts of the decision scenario. If you get

confused about where you are in the scenario or in the web pages, you may use the back button at the top of the page. However, this should only be done if you can see no other means of finding where you are.

Ready To Begin: Your New Identity

Now that you are ready to begin, we would like to ask you to assume a new identity. Please imagine that you are an active, married man. You just turned 60 and are very healthy. Try to keep this in mind as you make this medical decision. However, remember that even though your age may have changed, we want to know how you make decisions, so be true to your way of doing things.

Just so that we know you are ready to begin, turn to the experimenter and explain to him what you are supposed to do for this decision task.

Begin

News From Your Latest Physical

During your last routine physical exam your doctor noticed an unusual growth in your prostate. You were referred to a urologist after your initial PSA (prostate specific antigen) test came back higher than normal for a man your age. The urologist performed a series of tests (including another digital rectal exam (DRE), PSA tests and a trans-rectal ultrasound (TRUS)) to confirm the original results. All of the tests confirmed that something was abnormal with your prostate.

What Is It?

The urologist explained that there are a couple of conditions that can produce these results. The most common is called benign prostatic hyperplasia (BPH). This is a non-cancerous growth of the prostate. He explained that this growth is a normal part of the aging process and that when the prostate grows faster than expected it can produce elevated PSA levels. The other condition that could be causing the results is a cancerous growth within the prostate. Prostatic carcinoma is the second leading type of cancer among men (skin cancer is the most common). In addition, it is the second leading cause of cancer deaths among men (behind lung cancer).

The urologist explained that the TRUS results indicate that the PSA level is really higher than would be expected given the size of your prostate (high PSA density), and that it appears as though a small cluster of cells are responsible for the elevated PSA. He said "Now it could still be a benign growth in your prostate that is localized in this area. However, I need to tell you that it is more probable that we are talking about a malignant growth. The reason I say this is because of the results of the free-PSA test.
"This test looks for the proportion of PSA floating in your bloodstream unaccompanied by other blood proteins. The accepted cutoff for normal levels of free PSA is 25%. Less than that usually signifies cancer. Your percentage free-PSA is right around 22. By itself, this count isn't that far off normal, but in conjunction with the abnormal DRE, the elevated PSA, and the high PSA density it looks like the possibility of cancer is pretty high."

He insisted that even with all of the test results they have, it is impossible to know what your condition is without a biopsy. He explained that the only way to make a firm diagnosis of your condition was to have a pathologist analyze cells from the growth and the surrounding prostate tissue. He performs biopsies in his office. The procedure is very short and can be done with or without a local anesthetic. He would like to set up the biopsy as early as schedules will allow.

What would you do?

1) Schedule the biopsy
2) Delay the scheduling of the biopsy

You have scheduled your biopsy for next week. What would you like to do until then?

1) Nothing, try not to think about it

2) Seek information about biopsies.

3) Talk to your spouse

4) Talk to other family members and close friends.

5) Seek spiritual counsel (from clergy or others)

Continue

You have chosen to delay scheduling the biopsy. What would you like to do?

1) Seek a second opinion to determine if a biopsy is necessary.

2) Seek other information about biopsies.

3) Talk to your spouse

4) Talk to other family members and close friends.

5) Seek spiritual counsel (from clergy or others)

*Ready to schedule the biopsy

*Refuse to schedule the biopsy

Where would you like to look for information about biopsies?

Newspaper
Washington Post:
Who Wants to Know? A Simple Biopsy Technique Can Detect More Prostate Cancers Than Are Usually Caught. But Is This Really Useful?

Internet
American Cancer Society *News Today:*
Prostate Biopsy Need Not Hurt: Numbing Shot is Effective

WebMD:
Ultrasound and Prostate Biopsy

Video
Tests for the Detection of Prostate Cancer (Straight Talk on Prostate Health)

When you are finished with these sources click here

The Love of a Woman

After such a long and happy marriage, your wife continues to stand at your side. Your news of possibly having cancer shook her a great deal. But, she is strong and has pulled herself together. After supper, the two of you sat down and had a long talk about whether you should have the biopsy. While she believes you should find out what is going on with your body, she has agreed to support you in whatever you decide. Her main argument is that it would be hard to try and live as if everything was alright, when you really don't know.

You spent the rest of the evening talking, laughing and holding one another. She supports you, and you love one another more than either of you could express.

Family and Friends

You decided to go talk to your family and friends to get some insight and support. Everyone is supportive, but as with much of life, everyone seems to have a different perspective. Some of your friends tell you that doctors don't know what they are doing half the time, so don't worry about it. Others wonder what the heck you are even thinking about. More than once you heard "If the doctor told you to get a biopsy . . . get a biopsy!" A few of your friends have had biopsies and their experiences ranged from "uncomfortable," to "painful." Still, most of them said that they were glad they had them done.

Continue

Spiritual Guidance and Support

Seeking guidance and support from those you respect because of their spiritual lives is important to you. You contact a number of people and have been assured that they are interceding for you. While they were not able to tell you exactly what you should do, you are strengthened by knowing that they are behind you and are encouraging you.

Continue

---

*Refuse to schedule the biopsy

You decided not to schedule the biopsy. Needless to say, the urologist really felt that you were making a mistake by not finding out the status of the tumor. He encouraged you to take some time to think about the decision.

Two weeks have gone by when you receive a letter from the urologist. The letter asks how you are doing, but then quickly gets to the point. He is concerned about your health and would like to see you schedule a biopsy just so that you both can know if the tumor is benign. He emphasized that the procedure is short and that they use numbing procedures to make the discomfort minimal. The letter goes on to say that this is the only letter you will receive from him regarding this matter. He simply wanted to encourage you to get the test so that you can know what is happening in your body. His office would be calling in a couple of days to see what you would like to do.

Two days later, the phone rings. It is the urologist's office. What would you like to do?

Schedule the biopsy

Not schedule the biopsy

Biopsy Results

Your biopsy went fairly well. You were amazed at how much pain could be generated by a single needle (you opted for the localized anesthesia and, boy, are you ever thankful you did!). You waited four days for the doctor's office to call with the results of the biopsy. The news was not what you wanted to hear, prostatic carcinoma. The urologist scheduled a consultation appointment.

At the consultation the urologist explained that the growth was indeed malignant. He explained that cancer cells are rated in a couple of different ways. The most commonly referred to rating scale is the one used to indicate the stage of the cancer. Stage I indicates that the cancer cells are confined to the prostate and that they are too small to be detected by any means other than a biopsy. Stage II is cancer that is still confined to the prostate, but is large enough to be felt during a DRE. Cancer at either of these two stages is called "early stage cancer." These cancers are the most treatable because the cancer has not progressed outside of the host site.

Stage III indicates cancer that has invaded surrounding areas. Stage IV cancer is the latest stage of cancer. It entails the movement of cancer cells out of the area and into the bloodstream. At this stage cancer is referred to as having metastasized. Once the cancer has progressed to this stage it grows in other regions of the body.

The urologist explained that there is no evidence that the cancer has spread outside of the prostate. While the tumor is small, it is considered stage II because it was found through the DRE. He further explained that the other commonly used way of describing cancer cells is through "grading" using a Gleason score. The Gleason score describes how different the cells are from normal cells. The scale goes from 2 to 10. More abnormal cells receive higher grades. Your biopsy was graded as a 4. This is still considered low. He explained that this was a great sign, because it meant that the cancer was not aggressive. However, there is no way of knowing how long it will take to progress into a more dangerous form of the disease. At this point, the doctor explained the options you have for treatment.

Continue

Treatment Options

The urologist explained that there are three main types of treatment for early stage prostate cancer. These include radical prostatectomy, radiation therapy, and expectant therapy (watchful waiting). He explained that all three options had arguments for and against them. Each one had the potential for side effects and none could guarantee the elimination of the cancer.

Radical Prostatectomy

Radical prostatectomy is the most invasive means of treatment. He explained that this treatment involves a one and a half to three hour surgery. During surgery he would first take a biopsy of the lymph nodes in the pelvic region. Assuming the pathology report says the lymph nodes are cancer free, he will take out the prostate gland while trying to preserve as much of the soft tissue and nerves surrounding the prostate as possible. Since the tumor is small, the chances of eliminating the cancer is very good.
Since the treatment requires a major surgery, there is a slight chance (.5% to 3%) of death. However, the main side effects for this treatment are incontinence and impotence. While most men experience short-term problems with both, the long-term impotence occurs in 30% to 90% of patients. The large range mainly depends on how much of the nerve is spared and how much pretreatment difficulty a patient has in achieving an erection. Incontinence is universal for a short period after the catheter is removed. However, only 32% of men report any further incontinence, and only 7% of men report complete incontinence.

Radiation Therapy

Radiation therapy, on the other hand, has a lower risk of death with comparable or greater risk of side effects such as impotence and incontinence. Specifically, he explained, there is a 0.2% chance of death from the treatment. The rate of impotence is around 40%. Sixty percent of men report some degree of incontinence, while only 1% report complete control loss.

Of the other potential side effects, blockage of the urethra (called a urinary stricture) and rectal injury are the most common. Both treatment options involve risk of these effects. Surgery causes urinary stricture in 12% to 20% of patients, and causes rectal injury in approximately 30%. However, he noted, radical prostatectomy done with the retropubic (coming in from the abdomen region) method entails lower risk of rectal injury. Radiation therapy results in urinary stricture in about 5% of patients. Rectal injury occurs in approximately 11% of patients.

The doctor hands you a few pieces of literature which detail the numbers he explained to you. One piece, *Understanding Treatment Choices for Prostate Cancer,* also contains information about other aspects of the treatments. He then explained that the research is still unclear about which treatment is best for your type of prostate cancer. However, he cited research that suggests that if you are going to live longer than 10 to 15 years, the probability of reoccurrence is lower when a radical prostatectomy is chosen. He also reaffirmed his belief that because of the small nature of the tumor, there was a good

likelihood that he would be able to spare half of the nerves that allow erections (the half located on the side of the prostate that is tumor free).

Watchful Waiting

He then explained that there was a third option, watchful waiting. This is essentially a gamble that the cancer will progress slowly. If this option is chosen, the object will be to monitor the PSA levels so that if there is any indication that the tumor has grown, an alternate treatment can be selected. Of course, there are two big problems with this approach.

First, there is no way of knowing how long it will take for the cancer to grow or progress. The cancer might be very slow growing and might allow for decades of normal living prior to causing any difficulty. However, it might spread so fast that the window of treatability could be missed. In essence, he explained, this is a gamble. On the other hand, you have the benefits of avoiding all of the potential side effects that are caused by the other treatments. That is, you avoid them until you need to choose an alternative treatment option.

The main reason that watchful waiting is a plausible treatment option is that there is a lack of research findings indicating an increase in survival rate between treatment and non-treatment of prostate cancer. The reality is that the decision is a difficult one. You need to weigh the potential risks and benefits of each option and decide what way you want to treat this disease.

Would you like to choose an option, now?

Yes, I am ready to choose an option.

No, I need more time.

No, I need more time

What would you like to do before you decide on a treatment option?

1. Read the literature the urologist gave you
2. Find out more information
3. Seek another medical opinion
4. Get information from prostate cancer patients
5. Get information on homeopathic therapies
5. Talk to your spouse
6. Seek spiritual counsel (from clergy or others)

Ready to make a decision

Find Out More Information

How would you like to go about finding information?

Look for general prostate cancer and treatment information (what is cancer, cancer statistics, decision-making process, etc.)

Look for treatment specific information (radical prostatectomy, radiation therapy, etc.)

Look for information based on the type of media (print, internet, etc.)

When you are finished with this resource click here

What medical professional would you like to see?

Radiation Oncologist

Nationally Recognized Urologist

Tumor Board

When you are finished with this resource click here

Radiation Oncologist

Your family doctor referred you to a radiation oncologist. During your consultation with him, he agreed with the other physicians that you do indeed have stage II prostate cancer. The cancer does appear to be relatively small and confined to the prostate.

The oncologist recommended that you receive radiation therapy. He sited research that indicates that the probability of side effects with this treatment are much lower than with surgery. He also noted that because of the size and grade of the tumor, you would be a candidate for either external beam radiation or brachytherapy (seed implants). He said that it was really up to you regarding which one you wanted to do. Each is effective. The major differences have to do with time and the need for surgery.

Brachytherapy involves a one-time placement of radioactive seeds inside the prostate to kill the tumor. This is a relatively minor surgery. It involves some side effects such as bowel irritation and temporary impotence and incontinence. He explained that these symptoms usually clear up within the first few months.

External beam radiation involves the use of radiation waves being sent into the prostate area from an external source. The newest technique is called 3-dimensional conformal radiation therapy (3D-CRT). With this technique less radiation is administered to healthy tissue surrounding the tumor. It carries many of the same side effects as brachytherapy, but without the surgery. Treatment sessions last only a short period of time, but the whole appointment usually takes around 30 minutes. You will need to undergo treatments daily for a period of six to seven weeks.

In all, he explained, the decision is up to you. They perform both types of therapy at his clinic. If he had to choose, he would lean toward external beam because there is a small chance that the cancer could have begun penetrating the lining of the prostate. The external beam radiation would give a better chance of killing this cancer as well as the cancer located within the prostate.

Nationally Recognized Urologist

This urologist meets with you after having studied your file and talked with a well known pathologist in the same medical center. He explains to you that the results of your tests indicate that you do have organ-confined prostate cancer. There is no evidence that the cancer has spread through the lining of the prostate. Given your age and the grade of your tumor, the urologist explains that you have a couple of options. You could do nothing and be very diligent about watching your PSA and other tests. However, he believes that this is a gamble that is not worth the risk of missing the opportunity of successfully curing the cancer.

Radiation therapy is a good option that has shown to be relatively effective in small, localized cancers. However, the chance that the radiation might not get all of the cancer within the prostate is high. There have been a number of studies that have shown elevated PSA levels five years after radiation treatment. This indicates that the cancer was not successfully treated. As a result, he recommends that you choose nerve-sparing radical prostatectomy. He noted your good health will increase your chances of remaining potent and continent after surgery.

When you are finished click here.

Tumor Board

The tumor board for prostate cancer recommends several clinical trials which are currently underway. Each trail is aimed at providing evidence that one treatment option is more beneficial than the others. Of the ones now accepting new patients, you qualify for only one. It is a study in which patients diagnosed with Stage T1a through Stage T2b are being randomly assigned to one of three treatment options. The three treatment options are:

1) Watchful waiting. Participants assigned to this treatment option will receive PSA tests every 4 months and needle biopsies every two years.

2) Radical prostatectomy. Participants assigned to this treatment option will receive nerve-sparing (when possible) surgery to remove the entire prostate and the seminal vesicles. Follow-up PSA tests will be administered to confirm the removal of the cancerous gland.

3) Radiation therapy. Participants assigned to this treatment option will receive external conformal beam radiation therapy. Sessions will be given six days a week for a total of seven weeks. Follow-up PSA tests will be administered to monitor the success of the therapy.

If you choose to participate in this research, the treatment option will be assigned to you randomly. This is done so that there is minimal bias in the treatment selection process. It also allows researchers a greater ability to test the differences between the treatment therapies across all of the participants. This research is vital to achieve a better understanding of the relative benefits of these therapies. You are strongly encouraged to participate in this research!

When you are finished, click here.

Information from Prostate Cancer Patients

*Prostate Cancer "Poster Boy"

*Survivor Faces Cancer With Facts

*Save Your Love Life After Prostate Cancer Recovery

*Go to a Prostate Cancer Support Group Meeting

When you are finished with this information click here.

Prostate Cancer Support Group

You felt a little weird at first, but being at the support group meeting was a great experience. You listened to all of the men talk about issues of treatment decision making, side effects, and particulars about the experiences they had with therapies. You soon realized that prostate cancer experience is as different as the men are. Some had great experiences with few complications, while others had early reoccurrence and major side effects.

You stayed after the meeting to talk more specifically to a few men who seemed to be in the same decision-making boat you are in. They were very helpful. Though you still are uncertain about which treatment option is best, you are glad you found this support network.

Continue

Various Non-Conventional Treatment Approaches

General Overview of Options

Dietary Factors

Nutrients are key to preventing cancer

The dietary-prostate connection

Lycopene

Cancer researchers keen on tomatoes

Biochemistry of lycopene

Selenium

Selenium may fight prostate damage

Dietary selenium decreases DNA damage in dog prostate

Herbal

Herbal remedies can aid prostate health

Green tea doesn't help prostate cancer

When you are finished click here.

Spouse

The reality of potential side effects has been less dramatic for your wife than it has been for you. She continues to make sure that you know how much she loves you and wants to "beat this thing!" The thought of losing you is her main concern. She understands how difficult the decision is to make. She helps you as much as she can. Ultimately, she will support you no matter what you decide.

Continue

Clergy

Spiritual guidance is what you have needed to keep things in perspective. You are grateful for the concern and support you have gotten from the people you talk to. It hasn't been easy to talk to people about your situation, but knowing that people are supporting you has made a lot of difference. While your decision doesn't seem to get any easier, you do feel a bit more peace about it all.

Continue

Ready to make a decision

How would you like to treat this prostate cancer?

1. Radical Prostatectomy
2. External Beam Radiation Therapy
3. Brachytherapy (Internal seed implant)
4. Watchful Waiting (Do nothing now, but get checkups every 3 to 6 months)
5. Other

If you have changed your mind and are not ready to make a decision, click here

---

Thank you for participating in this medical decision task. The scenario is over. In reality, this might be the first in a series of treatment decisions you would have to make if confronted with prostate cancer. We hope you learned something about this disease from your participation in this task.

You are now finished with this computer. The experimenter will now give you a sheet to fill out regarding your decision. It contains instructions that will lead you through this part of the study.

Please leave this screen on while you finish. Someone will take care of computer--it is very important that you not shut down the computer.

APPENDIX H

Decision Rationale Questionnaire

Please write the treatment option you chose. If you selected "Other," please describe the treatment approach you would take. _____

_____

_____

_____

_____

What were the main factors that influenced your decision? (Please write in sentences)

_____

_____

_____

_____

_____

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_____

APPENDIX I

Debriefing Statement

The research you have just participated in **did not** make use of deception. The purpose the study was to gain a better understanding of some of the factors related to how men make medical decisions. The data gathered from you will be combined with those gathered from other participants.

If you experienced discomfort as a result of the content of this research, please talk to the principal investigator, Andrew Talbot. In addition, counseling services are available through the Lycoming-Clinton Mental Health and Mental Retardation office (570-748-2262).

Thank you very much for your help in this research project. If you would like to be made aware of the results of this study, please write your name and address on our list of those wishing to receive a summary of the research findings. These results will be available some time in the Fall of this year.

Sincerely,

Andrew Talbot
Principal Investigator
Phone: 893-2191
Email: atalbot@lhup.edu

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EDUCATION

Ph.D., Educational Psychology, The Pennsylvania State University, 2004
Master of Science, Educational Psychology, The Pennsylvania State University, 1995
Bachelor of Arts, Psychology, Taylor University, 1991

PROFESSIONAL EXPERIENCE

TEACHING

Assistant Professor, Psychology Department, Lock Haven University (Fall 1998—present). Teaching responsibilities include: Introduction to Psychology (PSYC100); Child Development (PSYC102); Educational Psychology for non-secondary education majors (PSYC201); Educational Psychology for secondary education majors (EDUC317)

Graduate Lecturer, Educational, School Psychology & Special Education Department (ESPSE), The Pennsylvania State University (Summer, 1996). Taught the graduate level course in learning theories: "Learning Processes in Relation to Educational Practices." (Edpsy 421)

Reading Comprehension Strategy Instructor (Spring, 1993—Fall, 1997). As part of a four year grant from the National Institute on Aging (NIA), the principle investigator, Dr. Bonnie Meyer, and I have conducted over 20 two-week long reading comprehension seminars for college-aged and older adults (age 65-80). This included a three-week visit to the University of Georgia in which I taught the seminar and trained additional instructors.

RESEARCH

Graduate Assistant, ESPSE, The Pennsylvania State University (Spring, 1994—Spring 1998). As part of the NIA grant to Dr. Bonnie Meyer entitled “Minimizing Age Differences in Reading: How and Why,” I assist in the coordination and instruction of training seminars, the collection, scoring and analyses of data, and the writing up of the findings. I have also been in charge of coordinating data transfer from the subcontract at the University of Georgia to our base at PSU.

Program Evaluator and Data Analyst, NASA-funded “Science Technology In the Classroom—Keystone State (STICKS; 1993). Responsibilities included design of an ongoing evaluation program, selection and implementation of evaluative measures, and data analysis for the project’s first phase.

SERVICE

Secondary Ed. Program Committee at Lock Haven University of Pennsylvania (Fall, 1998—present)
Student Evaluation Instrument Committee (Fall 2002 – Spring 2003)
Summer School Committee (Fall 2003 – present)

PUBLICATIONS

Meyer, B. F. J., Russo, C., & Talbot, A. P. (1995). Discourse comprehension and problem solving: Decisions about the treatment of breast cancer by women across the life span. Psychology and Aging, 10, 84-103.

Meyer, B. J. F., Talbot, A. P., & Stubblefield, R. A. (1998). Interests and strategies of young and old readers differentially interact with characteristics of texts. Educational Gerontology, 24, 747-771.

Meyer, B. J. F., Talbot, A. P., Poon, L. W., Johnson, M. M. (2001). Effects of structure strategy instruction on text recall in older African American adults. In J. L. Harris, A. Kamhi, & K. Pollock (Eds.), Communication and literacy in African Americans. Erlbaum.