Implicit Theories of Aging: Managing Professional Development

by

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Abstract

Younger (n = 21, aged 23 to 39 yrs.), middle-aged (n = 23, aged 40 to 59 yrs.) and older (n = 23, aged 62 to 84 yrs.) pharmacists and novices (younger: n = 21, aged 24 to 39 yrs.; middle-aged: n = 27, aged 41 to 58 yrs.; older: n = 17, aged 62 to 86 yrs.) were asked to describe their beliefs about how the work-related abilities of an aging pharmacist would change across time. Participants were also asked for their beliefs about how the aging pharmacist could compensate for declines in work-related abilities, as well as the effectiveness of those compensatory strategies. Results revealed that decline-oriented beliefs were significantly more prevalent than improvement-oriented beliefs for all participants. Pharmacists and novices indicated beliefs which parallel realistic age-related changes established in the cognitive aging literature (e.g., sensory, cognitive, and physical declines were expected). However, pharmacists were less likely than novices to comment on declines in work-related expertise, and more likely to comment on work-related improvements. Significant differences in the degree of differentiation present in participant's decline-oriented responses reflected the pharmacists' greater degree of pharmacy-related knowledge and experience. Analyses also revealed that work-related problems that were perceived to be more difficult to overcome (e.g., performance on speeded tasks) were also rated as being less controllable. In contrast, problems that were perceived to be easier to overcome (e.g., difficulties with pharmacy-related expertise) were rated as being more controllable. With respect to beliefs about compensation, pharmacists selected certain compensatory forms more frequently than others. The forms of compensation were rank-ordered from most to least frequently selected, as follows: remediation, accommodation, assimilation, selection, and substitution (see Dixon & Bäckman, 1995 for definitions). Pharmacists indicated a clear preference for remediative compensatory efforts, whereas novices indicated that selection and accommodation were perceived to be more effective. The adaptiveness and practicality of these

preferences is discussed in terms of what is understood about patterns in cognitive aging. Limits of generalizability and implications for managing professional careers are discussed.

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CHAPTER I

INTRODUCTION

Beliefs regarding the standard, or typical, course of development are often referred to as "normative conceptions" of developmental change, or "implicit theories of aging" (Heckhausen, Hundertmark, & Krüger, 1992; McFarland, Ross, & Giltrow, 1992). Examples of possible implicit theories of aging might include the beliefs that as people age, their sensory and motor abilities normally begin to evidence decline. Some research efforts have concentrated on describing peoples' implicit theories of aging, and are summarized in the following chapter. It should be noted, however, that the research to date has focussed on beliefs about how *average individuals or one's peers* are expected to age. In contrast, this research will focus on participants' beliefs about how the abilities of an *aging expert* are believed to change across later adulthood. In particular, participants' implicit theories of aging will be investigated with respect to an aging pharmacist (i.e., an expert in the domain of pharmacy).

Participants in the present study will be comprised of younger, middle-aged, and older pharmacists and non-pharmacists (i.e., novices). The inclusion of participants who vary along the dimensions of age and professional expertise will make it possible to examine potential age differences, expertise effects, and interactions when examining different aspects of their belief system.

Previous research concerning implicit theories of aging has established the fact that they normally include a proportionately larger number of beliefs which are decline-oriented as opposed to improvement-oriented (e.g., Heckhausen, Dixon, & Baltes, 1989; Heckhausen et al., 1992). Nevertheless, these studies highlight the fact that people believe that there are some selected gains continuing throughout later life. The veridicality of this profile of beliefs may be examined, as a sizeable amount of research exists which documents the *actual* changes which normally occur as individuals age. The present research examines participants' beliefs about the aging of a pharmacist's abilities in reference to what is already known about the normal correlates of aging.

In light of the salience of decline-oriented beliefs, the question of what can be done about such decline arises. This introduces the area of compensation. It should be noted that research concerning implicit theories of aging has not included a focus on peoples' beliefs about compensation. In contrast, the present research will ask participants for their beliefs about what the aging expert can do about expected declines in work-related abilities. Further, participants will be asked for their beliefs about the perceived effectiveness of a list of various compensatory strategies.

Overall, this research concerns itself with two broad areas. One area relates to participants' beliefs about how the abilities of an expert (i.e., a pharmacist) will "age" across later adulthood. The other area deals with participants' beliefs about how the aging expert may compensate for expected work-related declines. When combined, these two areas provide a larger perspective on the management of a professional's career. In other words, it would be valuable for a pharmacist to know how his or her work related abilities are generally *believed* to change over time, as well as how those same abilities have been *documented* to change over time. Obviously, access to this information would allow pharmacists to modify or "correct" their beliefs about the aging of their work-related abilities in situations where their beliefs markedly differ from what the research indicates.

In addition, pharmacists would most likely benefit from having information about the types of compensatory strategies that are commonly selected in response to work-related abilities which are believed to decline, as well as beliefs about the perceived effectiveness of those compensatory strategies. Again, knowing what age-related changes have been documented to occur would inform pharmacists as to the types of compensatory efforts that are likely to be most successful. Overall, the results of this study might help pharmacists, and possibly members of similar professions (e.g., doctors or nurses) to more effectively manage their careers over time.

CHAPTER II

LITERATURE REVIEW

Implicit Theories of Aging

Background

In a review by Heckhausen, Dixon, and Baltes (1989), it was reported that this phenomenon has been researched in the fields of sociology as well as psychology. From a sociological perspective, the origins and shape of normative conceptions of development are traced to social forces (Hagestad & Neugarten, 1985). For example, age stereotypes are endorsed by cultural and societal norms, and therefore influence our beliefs and expectations regarding what constitutes normal development. Within psychology, research concerning implicit theories of aging typically deals with the organization of subjective interpretations of developmental change.

General Characteristics

Several researchers investigating implicit theories of aging have reported that adults of all ages may share similar beliefs about the nature of age-related change across adulthood. Heckhausen et al. (1989) found that younger, middle-aged, and older adults shared similar beliefs about the desirability of changes occurring across adulthood, as well as their timing in the adult life-span. Similarly, Keller, Leventhal, Prohaska, and Leventhal (1989) reported that adults from all age groups had similar beliefs about certain illnesses associated with advancing age.

Age-related processes may be characterized as improving (gains), or declining (losses), or staying about the same (maintenance). Beliefs about the direction of change for aging-related processes can be characterized in the same way. Participants in the Heckhausen et al. (1989) study were given a list of 358 attributes (e.g., experienced, forgetful), and asked to comment on their beliefs about the developmental course of these attributes over the adult lifespan. Consistent with life-span developmental theory (Baltes, 1987), there was a shift in the gains:loss ratio. Specifically, proportionally more of the changes believed as generally occurring in early adulthood were gains (e.g., mentally healthy, experienced, thinking clearly), whereas more of the later life changes were losses (e.g., forgetful, bitter, slow). Again, it should be noted that early adulthood was not seen as being generally comprised completely of gains, nor was later adulthood seen as generally comprised wholly of losses. For example, results indicated that 20% of the total changes were expected to be *gains* in the ninth decade of life (e.g., dignified, wise).

Implicit Theories of Aging Regarding Specific Abilities

There is a paucity of research which deals directly with beliefs about age-related change in specific abilities. Further, in situations where this topic is discussed, it is not always the case that the comparisons are available between the beliefs of younger and older adults. Despite this fact, some general findings are summarized below.

Sensory Abilities. When examining beliefs about sensory abilities, it has been reported that adults of all ages believe that visual and auditory decline is age-related (Keller et al., 1989). Participants further indicated the general belief that vision and hearing loss were more serious, less controllable, less curable, and less preventable than a variety of other illnesses (e.g., high blood pressure, ulcers).

Memory and Cognition. While there is truth in the statement that younger adults generally outperform older adults in most tests of memory, there is also evidence that adults of all ages believe that memory loss is a normal part of aging (Dixon & Hultsch, 1983; Heckhausen et al., 1989; Lachman, 1991; Ryan, 1992). In fact, this belief may arguably be called an age stereotype, which is endorsed by much of society. Lachman (1991) noted that memory loss and aging can be viewed as a preoccupation in today's culture, as reflected in the prevalence of cartoons and jokes on the subject. In a review by Hultsch and Dixon (1990), it was noted that older adults generally tend to view themselves as less efficacious on cognitive tasks, as compared to younger adults. Further, older adults were also reported to be more likely to attribute poor performance on cognitive tasks to ability.

Motor Performance. The belief that older adults are frail, weak, and non-agile is quite pervasive. Spirduso and MacRae (1990) acknowledge that the prevailing stereotype is one where physical ability and efficiency improve in the early part of life, peak in the 30's, and then linearly decline until death.

Knowledge. As indicated by a study conducted by Heckhausen et al. (1989), features such as being wise, experienced, and well-read, were all believed by participants of all ages to increase well into old age. This study suggested that adults of all ages believed that aging was associated with an increase in features related to accumulated knowledge and experience.

Desirability of Age-Related Change

The study conducted by Heckhausen et al. (1989) also revealed the general belief that fewer and less desirable changes were expected to commence later in adulthood. To complement this information, the expected closing ages for developmental increases (i.e., the age when increases were believed to stop) were also correlated with ratings of desirability. It was revealed that attributes expected to close at later ages were also less desirable (e.g., forgetful, bitter, slow).

In contrast to this negative trend, it was noted that several desirable changes were expected to continue well into old age. As mentioned above, the authors indicated that numerous attributes (including being wise, dignified, experienced, well-read, mentally healthy, friendly, and honest) were seen as having increased into the seventies and eighties.

Complexity of Beliefs

Heckhausen et al. (1989) also reported findings which indicated that middle-aged and older adults were more likely than younger adults to possess a richer, more differentiated view of adult development. First, it was observed that as opposed to younger adults, the older groups were more likely to identify various psychological attributes as evidencing developmental increases with age.

Second, when considering the timing of developmental changes, the older adults were more likely than younger adults to indicate beliefs that were more differentiated and attribute-specific. This means that the onset ages of developmental change, and the subsequent closing ages were dependent on the abilities being considered. For example, older adults might believe that whereas the onset of skepticism begins in the mid 30s, and closes in the late 60s, curiosity might begin in the early 20s and continue until the 50s. In contrast, younger adults were more likely to hold less differentiated views of the timing of developmental change. These adults were more likely to rate the majority of abilities as beginning to change in the 20s, and closing in the 80s or 90s. The authors interpreted the more elaborate set of beliefs about developmental change possessed by older adults to be an index of an evolving system of knowledge about lifespan development.

Controllability of Age-Related Change

In subsequent research involving younger, middle-aged and older adults, Heckhausen and Baltes (1991) explored the issue of controllability of psychological change across adulthood. In this study, "controllability" referred to participants' estimates of their perceived ability to influence the course of numerous psychological constructs. Results revealed a somewhat optimistic finding, in which participants perceived a relatively high degree of controllability in areas ranging from intellectual achievement to emotional stability. This study also found that changes occurring earlier in adulthood were perceived to be more controllable than those expected to occur in old age. Further, more desirable features were perceived to be more controllable, even after partialling out the effects of onset age. A closer inspection of the data revealed that this result was stronger for middle-aged and older adults, as opposed to younger adults. The authors suggested that this pattern was consistent with an optimistic attributional bias. This refers to the idea that people are more likely to take credit for positive, as opposed to negative events. Since middle-aged and older adults are more likely to be confronted with decline, the adoption of this attribution bias was suggested to represent one form of successful life management.

Function of Implicit Theories of Aging

Normative conceptions act as a set of beliefs which guide one's expectations about the nature and timing of developmental changes that occur across the lifespan. For example, one may believe that adults in their 20s should be cognitively and physically fit, and beginning their careers. In contrast, one may believe that adults in their 40s should be cognitively fit, starting to experience physical decline in some areas, and reaching a peak in their professional careers. By adopting normative conceptions of development, one may use these beliefs as a reference frame in which to evaluate the self. In other words, individuals can compare their beliefs about the types of changes that occur as people age, with their own developmental past, present, and possible future (Heckhausen & Krueger, 1993).

The process of making such comparisons may result in the recognition that one's developmental status is congruent with one's implicit theories of aging, or that some discrepancy exists. One's beliefs about age-related change will therefore guide the timing and intensity of one's efforts to manage personal development. As an example, if an individual believes that forgetfulness is a normal and unavoidable correlate of aging, then little or no effort may be made to counteract an apparent increase in forgetfulness if it occurs on time. If an individual does not endorse this belief, or if the change is premature, greater efforts to counteract an apparent increase may be made.

Age-Related Change: What Actually Happens

So far, the research that has been discussed has focussed on defining the characteristics and functions of *beliefs* about age-related change. It is also valuable to consider the *actual* changes which have been established as occurring as adults age.

Sensory Abilities

Vision. The overwhelming majority of research findings suggest that vision declines as one moves through adulthood. In a review by Fozard (1990), numerous indices of visual decline were noted. For example, it was revealed that older adults (a) have slower visual processing speeds, (b) require higher amounts of illumination, (c) have difficulty reading externally paced displays such as scrolling TV displays, (d) have greater difficulty reading small print, (e) experience difficulty with visual search, (f) have lenses (within the eye) which are less effective at transmitting light, especially of shorter wavelengths, (g) are more adversely affected by glare, (h) have greater difficulty in ignoring visual distractions, (I) experience a reduced acuity for near and distant targets, (j) require higher contrasts in order to see detail, and (k) experience loss in depth perception.

Hearing. Fozard (1990) also reports findings from numerous studies detailing the age-related decline in auditory abilities. Specifically it was noted that as adults age, they (a) have greater difficulty tuning out background noise, (b) exhibit a higher threshold for higher frequencies, (c) have more difficulty recognizing consonants at lower decibel levels, especially for consonant sounds of shorter durations, (d) experience more difficulty hearing speech with a low degree of context (i.e. random words), especially when rapidly presented, and (e) have greater difficulty hearing and understanding speech which lacks normal fluctuations in tone and rhythm.

Overall, it would appear that despite the many declines in various aspects of visual and auditory capacity, there are some encouraging findings. Fozard (1990) reports that older adults seem to benefit as much or more than younger adults from good context and familiar stimuli.

Memory. Numerous age differences in favour of younger adults have been reported for various aspects of memory performance. In a review by Craik and Jennings (1992), age differences were reported in situations involving (a) episodic memory, or the ability to remember specific events from one's personal past, and (b) prospective memory, which involves the ability to remember something at a later time. In another review by Hultsch and Dixon (1990), it was also concluded that where working memory is concerned, studies typically show that when older adults must hold information in memory, and concurrently process additional information, they do not perform as well as younger adults. As an example, if one was asked to remember a phone number, and then repeat the numbers in reverse order, this requires the individual to store the information, as well as process it. It was reported that the age deficits in tasks such as this may be primarily related to the processing aspect, as opposed to the temporary storage of information (Hultsch & Dixon, 1990).

In contrast to these relatively established declines in various aspects of memory, a lack of such age differences were found in (a) procedural or implicit memory, which involves situations that do not involve the conscious awareness of having memorized information (e.g., word-stem completion), (b) semantic memory, which involves recalling information that has been learned, and (c) primary memory, which relates to consciously holding a small amount of information in memory (Craik & Jennings, 1992). In line with these optimistic findings, Hultsch and Dixon (1990) also cite research which focuses on maintaining or improving memory performance in older adults though the use of various strategies. These efforts often result in domain-specific improvements in memory performance. Hultsch and Dixon (1990) also note that greater verbal ability may tend to reduce the age deficits between older and younger adults in some recall tasks.

Motor Performance. Whereas Spirduso and MacRae (1990) acknowledge a general stereotype where adults are believed to become increasingly frail with age, the authors also recognize that there is substantial intraindividual and interindividual variability in motor performance across the lifespan. It is noted that the variability in motor performance of a given age group increases as a function of increasing age.

Research cited in this review indicated that when considering the job skills of adults ranging from their mid-50s to mid-70s, performance which was related to mobility, endurance, and lower body strength became more difficult with advancing age. However, for this same age range, it was reported that activities which involved freedom of movement and fine motor skills were much less affected.

In terms of capacity for physical work, the authors summarized research which indicated that as adults age, their capacity declines. This was indicated by a decline in maximal oxygen uptake (VO_2 max), which is an indicator of cardiorespiratory fitness. It should be noted that not all adults are expected to undergo similar decline, as other factors such as levels of exercise, disease, and genetic profile all contribute to determining one's cardiorespiratory condition.

Spirduso and MacRae (1990) also reviewed studies examining muscle strength in younger and older adults. Overall, it was noted that maximal strength is usually achieved during the 20s or 30s, and typically declines thereafter. Further, handgrip and arm strength have been reported to decline anywhere from 0 to 20% from the 20s to the 60s. Studies also reveal that the muscles of the lower body exhibit greater decline with age than the muscles of the upper body. It should be noted, however, that strength can be increased in both younger and older adults via exercises of sufficient intensity, duration, and frequency.

Another area of motor performance relates to muscular endurance. Spirduso and MacRae summarized literature in this area by noting that muscular endurance may be maintained rather successfully in older adults.

Speeded Response (Psychomotor). This refers to situations requiring a rapid response, using one or more limbs or digits, to some environmental stimulus. In general, older adults demonstrate greater response latencies as compared to younger adults when reaction times depend upon the processing of non-verbal material, or when the response itself becomes more complex (i.e., some co-ordinated response). However, it was also highlighted by Spirduso and MacRae (1990) that certain factors such as deliberate practice, more predictable tasks, and greater physical fitness, may contribute to reducing age deficits in reaction times.

Dixon, Kurzman, and Friesen (1993) investigated the effects of familiarity and practice in the context of handwriting performance, which is a commonly performed psychomotor task. In this study, it was found that in general, older adults produced slower handwriting speeds than younger adults, by a factor of 1.6. When the familiarity of the material to be copied was varied, it was found that age differences were attenuated for familiar tasks (e.g., copying words and sentences), and elevated for unfamiliar tasks (e.g., copying the letter "h" backwards). The authors also reported that practice was associated with a reduction in the slowing factor from 1.62 (initial efforts) to 1.02 (after practice). These results indicate that for psychomotor tasks which are more familiar and practiced, older adults may begin to narrow the gap in performance between themselves and younger adults.

Attention. As with many cognitive domains, the larger area of attention may be subdivided into smaller sections. A review of the literature regarding attention and aging was carried out by McDowd and Birren (1990). In this review, it was indicated that in cases of divided attention (i.e., situations where attention must be controlled to perform more than one task simultaneously), older adults demonstrate poorer performance than younger adults. Other studies which examined sustained attention via vigilance tasks, established that older adults are not as able as younger adults to detect target stimuli. Further age differences in favour of younger adults are found in tasks which involve selective attention (i.e., selectively attending to a target stimulus while filtering out extraneous stimuli). In contrast to these age differences, situations in which attention must switch from one source to another generally reveal a relative absence of age differences.

Creativity and Wisdom. Simonton (1990) reviewed the literature surrounding these two capacities. Based on longitudinal research, it was reported that creativity, as indexed by achievements (e.g., publications) or psychometric tests, tends to peak in early or middle adulthood and taper off thereafter. It should be noted, however, that the timing of the peak, as well as the size of the postpeak decline will tend to vary with the domain of creativity being considered. The author points to several studies which indicate that for some pursuits (e.g., pure mathematics and theoretical physics), the peak in creativity occurs somewhere in the late 20s or early 30s, with a relatively steep decline thereafter. In other areas (e.g., philosophy and writing novels), the peak occurs in the late 40s or early 50s, with a minimal decline occurring afterwards. These differences in the developmental course of creativity underscore the idea that creativity may continue well into later life.

Wisdom is also viewed as potentially increasing well into old age. Indices of wisdom generally relate to a rich knowledge about life and it's contextual, uncertain qualities. Simonton (1990) draws attention to research which attempts to examine the possession of wisdom. In studies of this nature, participants are often asked to consider concrete life issues (e.g., dilemmas, career choices), and their input is subsequently examined for evidence of "wisdom-related" attributes. The author notes that researchers in this area expect that while younger individuals may acquire varying levels of wisdom, it is expected that older participants will be found to demonstrate higher levels of wisdom.

Patterns of Intellectual Aging. In Schaie's (1990) Seattle Longitudinal Study, participants were assessed on multiple indicators of intelligence, at seven year intervals. These indicators include measures of: (a) verbal meaning, or the ability to comprehend words; (b) spatial orientation, which relates to the capacity to mentally rotate objects in two-dimensional space; (c) inductive reasoning, or the ability to infer rules from a set of examples which contain progressions of information; (d) number, or simple mathematical ability; and (e) word fluency, which involves the capacity to recall words according to lexical rules. When examining the *group* data, Schaie reports that, overall, gains occur until the late 30s or early 40s. This is followed by stability until the mid-50s or early 60s. Decrements which may begin in the 50s are quite small, and only become significant when approaching the 70s.

When *individual profiles* are consulted however, additional information is available. It was stated that global decline on all of the indicators mentioned above was extremely rare. In fact, this only began to appear when participants reached their 80s.

Examination of cohort effects produced an interesting picture of the differential trends associated with these abilities. The birth cohorts ranged from 1889 to 1959. It was noted that positive, almost linear trends were observed for the verbal meaning and inductive reasoning abilities. Spatial ability, in contrast, seemed to increase, and then level off. Word fluency and number skill, on the other hand, show either a stable or decreasing trend.

When examining the issue of intervention aimed at addressing cognitive decline, Schaie (1990) commented that intellectual decline in old age is not necessarily irreversible. It was emphasized that formal intervention strategies may be effective in allowing prolonged maintenance of high levels of cognitive abilities in community-dwelling older adults. Willis (1985) also noted that educational intervention often results in significant improvements in the abilities of older adult learners. The magnitude of such gains is often in the order of .75 to 1.00 standard deviations. The author noted that such training effects are relatively specific, in that improvements are largely seen in the target ability and other closely related skills, with minimal transfer occurring in increasingly divergent abilities. Further, improvements that are made are often relatively stable for periods of several weeks, up to one year.

Where overall cognitive performance is concerned, research suggests that engaging in a broad range of daily activities may also be related to maintained ability. Willis (1985) reported that decline in intellectual functioning was associated with leading a less actively engaged lifestyle, and family dissolution (e.g., the loss of a spouse). The author also suggested that higher educational achievement may also be associated with the maintenance of intellectual functioning.

<u>Use of New Technology</u>. A review carried out by Charness and Bosman (1992), suggested that older adults are less likely than younger adults to report using new technology such as banking machines, computers, word processors, and calculators. Smither and Braun (1994) arrived at a

similar conclusion and suggested that this situation may exist because the interface between technology and the older user often does not take into account the physiological and cognitive declines that may accompany aging. For example, the information which is displayed on computers or banking machines may be quite small, and presented too quickly. As mentioned earlier, older adults are more likely to require larger print sizes, as well as more time in which to read and process externally paced visual materials. In light of this, the average older adult may not view some technological innovations as being "user-friendly," and will subsequently avoid them.

Control

In a recent article by Heckhausen and Schulz (1995), a life-span theory of control was described. The concepts of primary and secondary control were introduced, and the authors demonstrated how these two types of control shift in terms of their predominance across the life course. Primary control refers to behaviours which target the environment, and involve efforts by individuals to modify their surroundings to better match their needs. For example, if an individual is experiencing losses in productivity, more effort, or changes in the working environment may resolve the problem. Secondary control, on the other hand, is associated with cognitive processes which aid in preserving and enhancing primary control, as well as minimizing losses in this area. Using the above example, an individual may lower his or her expectations about how much work can be done. This cognitive process would serve to align the individual's expectations with his or her ability to impact on the environment, thus enhancing the individual's sense of primary control.

Although the authors admit that there is some overlap between these two concepts, the distinction between the two types of control lies in *where* one's efforts are directed. Primary control principally involves direct action upon the immediate, external environment, whereas secondary control usually is associated with cognitive processes occurring within the individual.

Across the lifespan, individuals encounter different demands and challenges. In response to this, the preferred strategies of control will shift accordingly. For young and middle-aged adults, primary control is the most adaptive strategy. Most individuals in Western societies tend to slightly exaggerate how much primary control they actually possess. In fact, this slight exaggeration may be viewed as a healthy strategy which tends to enhance self-efficacy and self-esteem.

In older adults, there is also evidence for the stability of, and preference for, primary control across adulthood. In fact, in situations where the ability to exert primary control is reduced due to environmental constraints, undesirable mental and physical consequences may result (Heckhausen & Schulz, 1995). In spite of this, age-related changes often result in a diminished ability to exercise primary control. Biological and societal constraints limit the older adult's ability to directly impact on the environment. Therefore, as adults age, secondary control may occupy a more prominent role (Heckhausen & Schulz, 1995; Schulz, Heckhausen, & Locher, 1991).

Expertise

General Characteristics

Research in this area primarily focuses on describing the phenomenon and development of expertise, as well as drawing distinctions between expert and novice performance. In general, expertise in a given area is usually associated with a high level of skill in a given domain, and an extensive factual and procedural knowledge base (Glaser, 1986; Salthouse, 1987). This knowledge base is highly complex, yet organized in a manner that allows efficient and rapid access.

In other work, Glaser (1986) has summarized ten key characteristics regarding expertise, noting that it involves: (a) the continuous development of competence, (b) domain specificity, (c) the ability to perceive large meaningful patterns, (d) knowledge that is highly procedural and goal-oriented, (e) highly efficient memory search and general processing, (f) generalized thinking and problem solving skills, (g) self-regulatory processes in solution monitoring, attention, and sensitivity to feedback, (h) specialized schemata, (I) general problem solving processes, and (j) the influence of task demands.

To date, research in the area of expertise has focussed on a limited number of domains including chess and bridge (Charness & Bosman, 1990), athletics (Ericsson, 1990), memory (Kliegl & Baltes, 1987), and typing (Salthouse, 1984). These studies highlight the fact that despite declining abilities, older adults are able to maintain or improve their performance in a specific area of expertise.

Acquisition of Expertise

Ericsson and Charness (1994) claim that expertise is acquired through extensive practice, as opposed to being the result of innate talents. In fact, it has been suggested that to reach the level of expert status in the most complex domains (e.g., music, chess, physics), one must invest approximately ten years of deliberate practice, under the guidance of master teachers (Ericsson, Krampe, & Tesch-Römer, 1993).

Experts versus Novices

Research contrasting the performance of experts and novices in a given area represents another vein of research which reveals much about the dynamics of expertise. In contrast to traditional psychological research, where attempts are made to minimize the effects of prior experience on tasks designed to measure a given construct, studies examining the effects of expertise focus on highly familiar areas of knowledge. A review of this area by Ericsson and Charness (1994) highlighted findings that indicate experts approach problems in such a way as to systematically cue their knowledge structures, whereas novices typically proceed in a less orderly and efficient fashion. Differences such as these aid in defining expert performance.

Professional Expertise

Whereas expertise may typically be associated with certain domains, in the psychological literature (e.g., music, chess), it is also applicable to other equally relevant areas. Such areas may correspond to professional occupations. Involvement in a complex occupation over a long period of time may lead to the development of professional expertise. Using the medical profession as an example, physicians routinely undergo extensive education and training, followed by highly demanding careers. Throughout this process, experience and deliberate practice are continually being acquired, which may lead to expert status. Further evidence for the development of professional expertise has been established in studies which contrast medical experts with less experienced individuals. It has been shown that medical experts tend to comprehend and integrate information about patients, and reason forward towards a diagnosis, a process referred to as "forward reasoning." In contrast, novices are more likely to engage in "backward reasoning," which involves generating diagnoses and then looking for confirming and disconfirming evidence (Patel & Groen, 1991). In general, forward reasoning involves working forward from the given information into the unknown. On the other hand, backward reasoning involves working from a hypothesis about the unknown back to the given information. The authors note that forward reasoning is based on an extensive knowledge of a given domain.

It should be noted that professional expertise may similarly be associated with other health-related occupations such as clinical psychology (Smith, Staudinger, & Baltes, 1994), nursing, and pharmacy. However, professional expertise is not limited to health-related occupations. For example, the business environment represents a domain where managers and executives may also develop considerable expertise over time. Bray and Howard (1983) addressed this particular issue in their summary of the results of the AT&T Management Progress Study. This longitudinal study which spanned 20 years, followed the careers of college and high school graduates who began their careers with Bell Systems in 1956. Over the course of this study, some of the men advanced into higher managerial positions, whereas others were not offered promotions. It is arguable that those men who reached managerial status likely developed a certain degree of expertise within the business domain. From the results of this study, it was possible to compare managers with less prominent employees on a number of measures which were taken over the years. The two groups could be differentiated in several ways. For example, it was found that, in contrast to the less successful men, the more successful men: (a) had greater intellectual ability, (b) had a broader range of interests, (c) were more involved in their work, (d) rated their career as being more important, (e) were more achievement oriented and dominant, (f) were less deferential toward superiors and less nurturant toward others, (g) were more open-minded and less authoritarian.

Expertise and Compensation

It has been recognized that the areas of compensation and expertise are closely related, and may be viewed as complementary. Various authors have noted the fact that individuals with greater amounts of knowledge and experience within a given area may be able to maintain high levels of performance despite the presence of declines or losses (Baltes & Baltes, 1990; Charness & Bosman, 1990; Kliegl & Baltes, 1987; Salthouse, 1987).

Compensation

What Constitutes Compensation?

The concept of compensation has proven to be a complex and wide-ranging area of research, as evidenced by its presence in such diverse areas as sensory handicaps, cognitive deficits, interpersonal loss, and brain injury (Bäckman & Dixon, 1992). Because the concept of compensation is so widespread, it has acquired numerous uses and definitions. Researchers attempting to clarify the concept of compensation have introduced alternative views on this topic.

According to Dixon and Bäckman (1995), compensation involves four key elements: origins, mechanisms, awareness, and consequences. The origins of compensation are suggested to occur as a result of a mismatch between a person's skills and the demands of the environment. The mismatch may be due to a decline in the individual's skills despite consistent environmental demands. On the other hand, the imbalance may be due to increasing environmental demands that are not matched by an increase in the individual's skills.

The authors further suggested that several compensatory mechanisms exist. These include: (a) accommodation, which involves adjustments in the goal structure; (b) assimilation, which entails modifying behaviour in order to overcome losses; (c) selection, whereby the individual chooses from an array of possible directions or goals; (d) substitution, which relates to introducing a latent skill for one that is declining; and (e) remediation, which involves increasing the level of effort expended as a function of decline or impairment.

Dixon and Bäckman (1995) also noted that individuals need not be aware of their performance deficits in order for compensation to occur. In fact, the process of compensation may occur at an automatic level. The authors therefore suggested that awareness ranges along a continuum. This means that at the extremes, individuals may be highly aware, or completely unaware of their performance deficits and subsequent compensatory measures.

The authors also emphasized that there is more to compensation than managing a performance deficit. Beyond this, there is the issue of the consequences of compensation, which range along a continuum from positive to negative outcomes. In most cases compensation is functional or adaptive. However, it was noted that compensation may also have maladaptive consequences. For example, consider the case of an individual who has a visual handicap, and attempts to compensate by channelling all of his or her efforts into what remains of his or her visual ability. Such compensatory efforts may actively hinder the use of other substitutable modalities.

Salthouse (1995) offered a different perspective on the concept of compensation. He stated that compensation occurs when an individual demonstrates maintained performance of a given skill, despite the fact that the component abilities which underlie the skill are declining. Maintenance is achieved by engaging different processes or mechanisms. In the classic example demonstrated by

Salthouse (1984), older typists maintained their typing speed, despite the fact that some underlying typing abilities (e.g., tapping rate, and choice reaction time) were declining. This was accomplished by previewing a larger amount of upcoming characters.

Salthouse's (1995) definition of compensation corresponds to Dixon and Bäckman's (1995) mechanism of "substitution." Salthouse indicated that the remaining mechanisms as outlined by Dixon and Bäckman should be considered as separate concepts from what is referred to as compensation.

Brandstädter and Wentura (1995), when examining the changing developmental frontiers of the adult lifespan, offered a different means of classifying the mechanisms of compensation. They suggested that adaptation to the declines associated with aging may take the form of assimilative or accommodative strategies. The former approach involves actively altering or modifying the course of personal development. This refers to intentional efforts which are aimed at maintaining desired levels of functioning via preventive, corrective, or optimizing efforts. In contrast, accommodative approaches focus on adjusting personal goals and standards to become more congruent with the constraints of one's developmental status. The authors proposed a functional primacy of assimilative efforts. That is, as long as individuals are able to implement assimilative strategies, they will be preferred over accommodative strategies. It is only when these assimilative efforts exceed personal resources that accommodative strategies begin to be employed.

It should be noted that several of the compensatory strategies mentioned by various researchers above, bear a close resemblance to Heckhausen and Schulz's (1995) concepts of primary and secondary control. Specifically, primary control is similar to (a) Dixon and Bäckman's (1995) mechanisms of assimilation, substitution, and remediation, (b) Salthouse's (1995) notion of compensation, and (c) Brandstädter and Wentura's (1995) strategy of assimilation. The similarity stems from the fact that an emphasis is placed on an active approach to compensation, where individuals "do" something to manage performance deficits. In contrast, secondary control resembles (a) Dixon and Bäckman's (1995) mechanisms of accommodation and selection, and (b) Brandstädter and Wentura's (1995) accommodative strategy. In this case, the unifying theme is an emphasis on cognitions, where the individual alters his or her goals, or chosen environments in order to manage decline.

Compensation in Professional Life

As mentioned above, the phenomenon of compensation may be found in numerous domains. Compensation may also occur in everyday professional life. Over the course of a career, performance deficits may arise. This may occur if the job-related abilities of the aging professional undergo decline in the face of consistent environmental demands. It is also possible for the environmental demands to increase without a corresponding increase in the skills of the aging professional. In either case, the aging professional may be in a position to compensate for performance deficits via any of the strategies mentioned above.

Selective Optimization With Compensation

Baltes and Baltes (1990) outlined three related strategies that may be employed in order to adapt to age-related decline. The model is referred to as "Selective Optimization with Compensation." The process of "selection" refers to narrowing one's activities to a smaller number of high priority domains. For example, an older individual who wishes to maintain his or her performance in one principal domain (e.g., being a musician), may have to reduce or forego other more peripheral activities (e.g., bridge club, gardening). "Optimization," involves improving one's performance levels, and maximizing one's chosen life course. Using the above example, the older individual may decide to invest more time practicing and refining his or her technique. Finally, "compensation" refers to strategies which are geared towards managing losses which occur in the domain which has been selected. As an example, the older individual may begin using musical scores which are printed in a larger typeset to manage declines in visual acuity.

Overall, Baltes and Baltes (1990) pointed out that the model of Selective Optimization with Compensation may be applied to any domain of life. Based on this premise, Abraham and Hansson (1995) investigated how the model might apply to the working environment. In this context, selection strategies related to the process of reorganizing and narrowing one's job-related abilities. Optimization strategies referred to ways in which the older worker might maximize performance in more prominent job-related responsibilities. Finally, the authors chose strategies which helped to make one's skills and accomplishments highly visible to others to be representative of compensation. The results of this study provided evidence that the model may aid in understanding how older employees are able to maintain important job competencies in the face of age-related losses. Specifically, it was demonstrated that the relationship between selection and self-reported performance maintenance increased with age. Further, the relationship between optimization and compensation and goal attainment (i.e. the extent to which individuals were able to maintain performance levels in personally meaningful areas) also increased with age.

Present Study

The present study involved the investigation of two main areas: participants' implicit theories of aging and their beliefs about compensation. These two areas will now be discussed separately, with hypotheses clearly outlined.

Participants' Implicit Theories of Aging

Initially, all participants were asked the open-ended question: "Can you think of any abilities that change as one gets older, especially abilities that could have an impact on the work performance of middle-aged and older pharmacists?" The phrasing of this question did not suggest that participants consider either declines or improvements, which left room for participants to comment on either of the developmental courses, or both. Following this, younger, middle-aged and older pharmacists (and not novices) were asked for their beliefs about (a) which job-related abilities would specifically tend to decline or improve in the aging pharmacist, and (b) the degree of decline or improvement that is believed to occur in the job-related abilities of an aging pharmacist.

When considering the above questions, it may be useful to initially explore the degree of differentiation (i.e., breadth and depth) present in participants' beliefs. The degree of differentiation will be indicated by three separate measures. First, the number of words used in the expression of a particular belief will be examined. It is arguable that more complex and detailed beliefs should require more words to express. Second, the number of personal elaborations will be studied. Personal elaborations refer to ideas which relate to one's personal experience (e.g., "I remember when my eyesight began to decline"). Third, the number of knowledge elaborations may be examined. Knowledge elaborations refer to ideas that do not involve a reference to the self (e.g., "An aging pharmacist is likely to have trouble keeping up to date with new medications").

In reference to participants' evaluations of the job-related abilities of the aging pharmacist, two specific hypotheses are offered. First, an Age X Expertise interaction in the degree of differentiation of beliefs is predicted when pharmacists and novices are compared. Specifically, middle-aged and older pharmacists are expected to indicate beliefs which are the most differentiated, whereas younger novices will indicate the least differentiated beliefs. This prediction is partly based on research which suggests that individuals with greater amounts of expertise possess a larger domain-specific knowledge base, and are able to more efficiently access this knowledge as compared to individuals with less expertise. This prediction is also based on the study conducted by Heckhausen et al. (1989) which revealed that middle-aged and older adults were more likely than younger adults to view the timing of developmental changes as being attribute-specific, indicating more differentiated views.

It should be noted that younger pharmacists as well as middle-aged and older novices are expected to indicate beliefs which are moderately differentiated. It is arguable that although younger pharmacists have acquired some degree of professional expertise, they are less apt to be familiar with the more subtle aspects of the aging of pharmacy-related abilities. On the other hand, middle-aged and older novices while having no expertise in the domain of pharmacy, are more likely to have first-hand knowledge of how various abilities change with age. For these reasons, both younger pharmacists as well as middle-aged and older novices should occupy an intermediate position with respect to the degree of differentiation of their beliefs.

In cases where the beliefs of only pharmacists are compared (not novices), Age effects are expected in the degree of differentiation of beliefs. Specifically, middle-aged and older pharmacists are expected to indicate beliefs which are more differentiated than their younger professional peers.

Age effects are also predicted when considering the number of optimistic (i.e., improvement-oriented) beliefs indicated by pharmacists. Novices will not be included in this analysis as they will not be specifically asked for their beliefs about which job-related abilities improve in the aging pharmacist. It is predicted that middle-aged and older pharmacists will indicate a greater number of optimistic beliefs than younger pharmacists. The number of optimistic beliefs will be represented by the number of personal and knowledge elaborations which are improvement-oriented. This prediction is based on the findings of Heckhausen et al. (1989), which indicated that middle-aged and older adults were more likely to indicate beliefs about age-related improvements, as opposed to younger adults. This is also based on the likelihood that middle-aged and older pharmacists have personally experienced improvements in various pharmacy-related abilities over time, thus making them more familiar with such gains. Finally, it seems reasonable that an optimistic orientation towards the aging of abilities might serve to enhance a sense of primary control. In other words, the belief that certain abilities will improve with age might aid in providing an individual with a sense that some resources (i.e., abilities) will be usable, perhaps well into old age. These resources may be used in order to have a direct impact on the environment (i.e., to exercise primary control).

Pharmacists (not novices) will also be asked to indicate their beliefs regarding the degree to which a list of pharmacy-related abilities will either improve or decline as the average pharmacist gets older. Pharmacists will be asked to indicate their beliefs using a scale which ranges from 1 (much better with aging) to 5 (much worse with aging). In keeping with the optimistic trend predicted above, middle-aged and older pharmacists are expected to produce an overall rating which is more favourable (i.e., closer to the value of "1") than younger pharmacists.

General Expectations. Apart from the formal hypotheses outlined above, some additional expectations will now be outlined. It is stressed that these expectations do not constitute hypotheses which are the central focus of this study, but merely serve to confirm relatively established trends found in the literatures pertaining to aging as well as life-span development. However, the inclusion of these general expectations serves a worthwhile purpose in providing a means to check whether or not the results of the current research are in agreement with previously established research findings.

First, expectations are offered as to which pharmacy-related abilities will be indicated as improving or declining. Abilities that will be identified as improving with age are expected to be those which are largely dependent on accumulated knowledge and experience in the pharmacy domain. For example, an aging pharmacist's ability to run a pharmacy is likely to be identified as improving with age, as this type of ability depends on knowledge and experience which is amassed over time. Support for this expectation is supplied by three different areas of research. First, research in the area of expertise indicates that professional expertise is associated with the accumulation of an extensive factual and procedural knowledge base within a given occupational domain. Second, research conducted by Heckhausen et al. (1989) revealed that participants considered attributes such as being experienced, well-read, and wise to increase well into old age. It is arguable that these attributes are all strongly related to one's knowledge and experience. Third, research typically reports maintenance or improvements in acculturated knowledge with age, a construct which is referred to as "crystallized intelligence" in the intellectual aging literature (Cattell, 1971; Horn, 1982), or the "pragmatics of intelligence" in the life-span development and aging literature (Baltes, 1987). These bodies of literature generally indicate that factual and procedural knowledge increase as individuals age. Taken together, these three areas of research would suggest that abilities which tap an increasing knowledge base should demonstrate improvement over time.

In contrast, it is predicted that abilities that will be indicated as declining with age are those which are largely independent of one's accumulated knowledge and experience. For example, hearing and vision loss are commonly indicated as a normal correlates of aging, but have little to do with one's store of knowledge or experience. Other examples of abilities that are expected to decline are those that involve memory, mobility, and speeded response. In each of these areas, there is evidence to suggest that adults of all ages believe that decline occurs with advancing age.

Another general expectation is that overall, participants will indicate more decline-oriented beliefs as opposed to improvement-oriented beliefs. As stereotypes in our society generally foster the belief that aging is associated with a general, pervasive, overall decline, it is reasonable to expect that all participants will indicate beliefs that are in accordance with this trend. This expectation is also in line with life-span developmental theory (Baltes, 1987), which states that the ratio of gains to losses decreases as one ages.

Participants' Beliefs About Compensation

Effort Involved. In order to investigate this issue, pharmacists (not novices) will be asked to rate how difficult or easy it would be for an aging pharmacist to overcome difficulties that are experienced in a list of pharmacy-related abilities (e.g., speed at filling prescriptions, knowledge of local physicians). Ratings will be conducted using a 5 point scale which ranges from 1 (very easy to overcome) to 5 (very difficult to overcome). Age effects are predicted when considering the ratings of improvement or decline. Middle-aged and older pharmacists are expected to indicate that problem areas are easier to overcome than younger pharmacists. This prediction is based on the assumption that older pharmacists have likely had a greater amount of experience working in a pharmacy, and have also likely experienced some type of decline associated with aging. Therefore, it seems reasonable that they would have a better grasp than younger pharmacists regarding various problem areas which may be most favourably geared towards compensatory efforts. As well, the findings of Heckhausen et al. (1989) seem to suggest that middle-aged and older adults are more likely than younger adults to see some positive (i.e., gains) changes occurring with advancing age.

With respect to which problem areas are expected to be easier or more difficult to compensate for, tentative hypotheses are offered. In general, problems areas which may be perceived as being more controllable should be considered easier to overcome. Since an individual's knowledge base and experience are somewhat controllable, problems in these areas should be rated as easier to overcome. In contrast, problems which are commonly believed to be inevitable and age-related (e.g., difficulties with memory and mobility) should be indicated as more difficult to overcome.

In order to validly assign a value of perceived controllability to each ability, it will first be necessary to conduct a preliminary study which will explore this issue. A small sample of graduate students and older adults will be recruited for this purpose. Agreement between younger and older adults is expected based on previous research conducted by Heckhausen and Baltes (1991). This study revealed that adults aged 20 to 90 shared similar views as to the perceived controllability of a list of 163 attributes. By using the ratings obtained from the current preliminary study, it will be possible to examine whether perceived controllability is related to ratings of how difficult or easy it would be for an aging pharmacist to overcome difficulties in several problem areas.

The Form of Compensation. Pharmacists (not novices) will be asked to specify how they believe an aging pharmacist could compensate for each problem area they identified as being difficult to overcome. Overall, two hypotheses will be advanced regarding the forms of compensation chosen by participants (i.e., accommodation, assimilation, selection, substitution, and remediation). The first hypothesis deals with the degree of differentiation present in the beliefs of pharmacists regarding the issue of compensatory strategies. It is predicted that middle-aged and older pharmacists will produce more highly differentiated views as compared to younger pharmacists. As middle-aged and older pharmacists are more likely to be familiar with declines in various pharmacy-related abilities, they are also more likely to have a deeper understanding of what can be done about such declines.

The second hypothesis deals with predicting which of the five compensatory strategies are most likely to be chosen by pharmacists. Prior to stating an explicit hypothesis, some basic assumptions will be discussed. To begin with, it is assumed that middle-aged and older pharmacists will be more likely than younger pharmacists to endorse a wider variety of compensatory strategies. This assumption is based on two lines of reasoning. First, it is likely that middle-aged and older pharmacists have experienced varying degrees of decline in various pharmacy-related abilities. As a result of this experience, they may be more likely than younger pharmacists to realize that varied strategies of compensation are useful in managing declining abilities. For example, a decline in the ability to perform speeded responses may be compensated for by lowering one's expectations about how quickly one can work, or choosing tasks where speed is not salient. In contrast, a decline in remembering the location of items in the pharmacy might respond well to increased efforts to remember (e.g., periodic rehearsal of item locations). Second, based on the premise that middle-aged and older adults may tend to hold more optimistic views of the aging process, it seems likely that they would endorse a belief that a greater variety of compensatory strategies would be effective in addressing declines.

Following from this, it is assumed that younger pharmacists will indicate more uniform views regarding their choices of compensatory strategies. It is likely that younger pharmacists will choose the strategies of accomodation and selection more frequently than the remaining compensatory strategies. This is because they are less likely to hold differentiated views of the aging of pharmacy-related abilities, as well as the fact that they have not likely had experience in having to manage declining job-related abilities. Further, it has been established that changes that occur with age are more likely to be seen as less controllable, and less desirable (Heckhausen & Baltes, 1991; Heckhausen et al., 1989). For these reasons, younger adults may be likely to choose compensatory strategies which focus on the acceptance of declining abilities (i.e., accomodation and selection).

Given the assumptions that middle-aged and older pharmacists are likely to choose more of the five forms of compensation, whereas younger pharmacists are likely to display more uniform choices (i.e., by selecting the strategies of accomodation and selection), Age effects are predicted with respect to the frequency with which the strategies of assimilation, substitution, and remediation will be chosen. Specifically, it is predicted that middle-aged and older pharmacists will choose the strategies of assimilation, substitution, and remediation more frequently than younger pharmacists.

<u>Perceived Effectiveness of Compensatory Strategies</u>. As suggested by Dixon and Bäckman (1995) compensation may have outcomes that range along a continuum from positive to negative results. In a similar fashion, individuals may have beliefs about the perceived effectiveness of various compensatory strategies. In order to investigate this issue, both pharmacists and novices were asked to rate the likelihood of success of various compensatory strategies. Ratings were carried out using a scale which ranges from 1 (very unlikely to be effective) to 5 (very likely to be effective). An Age X Expertise interaction is predicted based on the ratings of effectiveness of the strategies of assimilation, substitution, and remediation. Specifically, middle-aged and older pharmacists are expected to indicate the highest ratings of effectiveness for these compensatory strategies, whereas

younger novices are expected to indicate the lowest ratings. Younger pharmacists, as well as middle-aged and older novices are expected to indicate intermediate ratings of effectiveness for these compensatory strategies. This is because young pharmacists have some degree of knowledge and experience within the pharmacy domain, and may therefore be aware of situations in which active strategies of compensation are likely to be effective. Middle-aged and older novices, while having no pharmacy-related experience, are likely to be more familiar with declines that occur with age. Because of this, they may also have some knowledge of situations in which active compensatory strategies may be useful.

No differences between pharmacists and novices are expected when considering the ratings of effectiveness associated with the strategies of accommodation and selection. It is expected that both pharmacists and novices of all ages will indicate that these more passive compensatory strategies are moderately to highly likely to be effective. This prediction is based on the fact that individuals of all ages realize that certain abilities do show some decline with aging. Acceptance of such decline via the compensatory forms of accommodation or selection would represent two ways of managing losses which require minimal effort. Similarly, based on the research conducted by Brandstädter and Wentura (1995), it seems reasonable to assume that adults of all ages (regardless of whether they are pharmacists or novices) will realize that in certain situations, environmental demands may overtax the resources of the average aging adult. In these situations, accommodative efforts would likely be seen as appropriate.

CHAPTER III

METHOD

It should be noted that the data set pertaining to pharmacists and novices was part of a larger investigation sponsored by the Canadian Aging Research Network (CARNET). The research was conducted at the University of Victoria between March, 1993, and September, 1993, by Dr. Roger A. Dixon, and explored numerous topics related to the pharmacy domain. Therefore, all of the information collected from pharmacists and novices constitutes secondary data. Due to practical limitations, certain research questions were directed at pharmacists only, whereas other questions were directed at both pharmacists and novices. Appropriate mention will be made throughout this research as to which groups will be involved in the exploration of a given research issue.

The pilot studies involved in the present study were carried out separately by this author in order to answer additional research questions.

Participants

Participants (N=137) were recruited via an advertisement placed in the newspaper, or posters placed around the University of Victoria campus. The sample of young pharmacists (n=21) consisted of 8 males and 13 females (age range 23-39). Younger novices (n=21) were represented by 7 males and 14 females (age range 24-39). Middle-aged pharmacists (n=28) consisted of 12 females (1 retired) and 16 males (age range 40-59). Middle-aged novices (n=27) consisted of 16 males (2 retired) and 11 females, two of whom were retired (age range 41-58). Of the older pharmacists (n=23), 7 of the 17 males were still working, whereas 1 of the 6 female pharmacists was still employed (age range 62-84). Older novices (n=17) consisted of 4 females (1 retired) and 13 retired males (age range 62-86). This age-stratified sample was obtained by screening potential participants' in order to match pharmacists with novices as closely as possible with respect to age, gender, work status (i.e., retired versus working), and years of education. Vocabulary scores revealed that older adults (M=29.70) outperformed the middle-aged (M=25.30) and younger adults (M=23.64), $F(2,133) = 11.36$, $MSE = 35.51$, $p<.001$. Pharmacists (M=17.25 yrs.) acquired more years of formal education than novices (M=14.97 yrs.), $F(1,135) = 32.27$, $MSE = 5.51$ $p<.001$. Pharmacists were paid $50.00 per session, whereas novices were paid $20.00 per session.

Pilot Study Participants

A pilot study was also carried out in order to validate two important measures. Thirty additional participants were asked to volunteer to take part in this study. Of these 30 participants, ten were graduate students, ten were middle-aged adults, and ten were older adults. The graduate students were approached on the University of Victoria campus and asked for their participation, whereas the middle-aged and older adults were approached at a local shopping mall. Each of these groups was made of up 5 males and 5 females. The graduate students (M = 28.20 yrs.) ranged in age from 25 to 33. The middle-aged adults (M = 45.90 yrs.), ranged in age from 43 to 52. The older adults (M = 67.50) ranged in age from 61 to 81.

Materials and Procedure

Participants were interviewed individually, and all interviews were videotaped to facilitate later data coding and transcribing. The videotape was not used, however, during the time that informed consent was being obtained, or when participants were completing written tasks (e.g., the personal information questionnaire and the vocabulary test).

Prior to beginning the interviews with all participants, informed consent was obtained. Following this, participants were asked to complete the personal information questionnaire.

Personal Information Questionnaire (PIQ)

This 18-item questionnaire gathered general demographic information (e.g., gender, age, education).

Vocabulary

All participants were then given 6 minutes to complete a standardized 36-item vocabulary test adapted from the Kit of Factor Reference Cognitive Tests (Ekstrom, French, Harman, & Dermen, 1976). This test examined knowledge of word meanings which varied in terms of difficulty.

Implicit Theories of Aging: Beliefs About Age-Related Ability Change

Pharmacists and novices were then asked an open-ended question which solicited their thoughts about how pharmacy-related abilities may change as one gets older. Specifically, participants were asked to focus on abilities they believed change with age, and therefore have a bearing on the work-related performance of middle-aged and older pharmacists. Participants' responses were classified by the experimenters into 15 categories: (a) visual decline, (b) auditory decline, (c) tactile decline, (d) mobility decline, (e) memory decline, (f) other cognitive functioning decline, (g) more expertise related to pharmacist role, (h) more patience, (I) more expertise related to dealing with customers, (j) more expertise related to dealing with managerial issues, (k) less expertise related to pharmacist role, (l) less patience, (m) less expertise in dealing with customers, (n) less expertise at managerial issues, and (o) other.

Whenever a participant produced a response which fell into one of the above-mentioned categories, the response was further analyzed in relation to three dimensions of the degree of differentiation present in the response. They were: the number of words used to respond; the number of personal elaborations used; and the number of knowledge elaborations used.

Specific Beliefs About Which Abilities Improve / Decline

Pharmacists (not novices) were then asked to consider which abilities would specifically tend to improve or decline for the average aging pharmacist. Participants' responses were again classified into the categories mentioned above, and analyzed to yield the three measures of differentiation. The number of words, personal elaborations and knowledge elaborations that were improvement-oriented and decline-oriented were each totalled for each pharmacist.

Beliefs About the Degree of Improvement / Decline

Pharmacists were then given a list of pharmacy-related abilities, which were originally generated by Dr. Roger A. Dixon (this author's thesis advisor), and were asked to rate the degree to which various abilities generally improved or declined as the average pharmacist aged. The abilities corresponded to: (a) knowledge of regular customers; (b) knowledge of how the business is run; (c) ability to operate new technologies; (d) awareness of new drugs on the market; (e) remembering where specific items are located in the pharmacy; (f) ability to give advice about over-the-counter drugs; (g) communicating effectively with customers; (h) knowledge of local physicians; (I) ability to read hand-written prescriptions; (j) speed at filling prescriptions; (k) communicating effectively with older adults; (l) errors in filling prescriptions; (m) absenteeism; (n) ability to delegate to assistants or younger pharmacists; (o) punctuality; (p) reliability; (q) speed at locating items in the pharmacy; (r) knowledge of ethics and regulations; (s) empathy with customers; (t) ability to adapt to changes in the pharmacy or the profession; (u) ability to follow written directions and instructions; (v) patience; (w) ability to express instructions orally; (x) ability to train assistants and younger pharmacists; (y) other skills that may get better with age; and (z) other skills that may get worse with age. Participants indicated their beliefs as to the trajectories of these various abilities by using a response scale which ranged from 1 (much better with aging) to 5 (much worse with aging).

Compensation: Effort Involved

Using the same list of abilities mentioned above, pharmacists were then asked to indicate the degree of difficulty or ease with which an older pharmacist would be able to overcome problems in each of the listed abilities. Participants used a response scale which ranged from 1 (very easy to overcome) to 5 (very difficult to overcome).

As mentioned earlier, it was also tentatively predicted that problem areas that are perceived to be more controllable, may also be perceived to be easier to overcome. A preliminary study was conducted in order to assign a value of perceived controllability to each ability. Using the list of pharmacy-related abilities, a small sample of graduate students and older adults (n=10 each) was asked for their beliefs about how controllable each ability is. A rating scale was used which ranges from 1 (very controllable) to 5 (very uncontrollable). The average ratings of perceived controllability obtained from the graduate students were then compared with those obtained from the older adults to verify the presence of agreement (i.e., similar ratings of controllability).

Compensatory Categories: Pilot Study

A pilot study was conducted in which a list of 21compensatory strategies were categorized according to which form of compensation they represented (i.e., either accommodation, assimilation, selection, substitution, or remediation). The compensatory strategies which were derived from an analysis of the forms of compensation outlined by Bäckman and Dixon (1992) included: (a) delegate difficult tasks to a younger person, (b) avoid having to perform tasks that become difficult with age, (c) try harder when performing tasks that become difficult with age, (d) get more practice at the difficult tasks, (e) modify your expectations (your performance does not have to be perfect), (f) seek more training or updating of skills, (g) budget more time to spend on the difficult tasks, (h) find alternative tasks to concentrate on, (I) explain to others that you are having some difficulties because of your age, (j) do more administration or organizational activities, (k) no way of overcoming, retirement, (l) I don't know, (m) other, (n) recognition of problem, become aware of problem, (o) consult with someone else, (p) counselling, (q) experience, more experience - not practice, (r) rely on others, (s) look for another job, changing jobs, leave the job, (t) improve health, get help specific to health, and (u) organize, organization.

A small sample of graduate students, middle-aged adults, and older adults (n=10 each) was given the list of compensatory strategies mentioned above, as well as a brief description of each of the five forms of compensation as outlined by Dixon and Bäckman (1995). These participants were asked to indicate which of the five forms of compensation was represented by each compensatory strategy on the list. By using the results of this pilot study, it was possible to analyze the number of times that pharmacists selected each form of compensation, as well as the degree of differentiation present in those choices.

The Form of Compensation

For each problem area identified as being difficult to overcome, the open-ended question of how an older pharmacist might overcome the difficulty was posed to younger and older pharmacists. Participants' responses were initially classified into the 21 compensatory strategies mentioned above. Using the results of the pilot study, participants' responses will then be classified into the five forms of compensation (i.e., accommodation, assimilation, selection, substitution, and remediation).

Perceived Effectiveness of Compensatory Strategies

Finally, both pharmacists and novices were presented with a list of possible ways of overcoming age-related decline in pharmacy-related performance, and asked for their beliefs as to how likely they were to be effective. This was accomplished using a scale which ranged from 1 (very unlikely to be effective) to 5 (very likely to be effective). The list of ways of overcoming decline were representative of the five forms of compensation (Bäckman and Dixon, 1992), and included: (a) delegate difficult tasks to a younger person; (b) avoid having to perform tasks that become difficult with age; (c) try harder when performing tasks that become difficult with age; (d) get more practice at the difficult tasks; (e) modify your expectations (your performance does not have to be perfect); (f) seek more training or updating of skills; (g) budget more time to spend on the difficult tasks; (h) find alternative tasks to concentrate on; (I) explain to others that you are having some difficulties because of your age; (j) do more administration or organizational activities; and (k) no way of overcoming.

CHAPTER IV

RESULTS

The Role of Gender or Work Status

Preliminary tests were conducted in order to examine the extent to which Gender and Work Status (i.e., retired vs. working) of the participants were related to the principal dependent variables. Specifically, analyses of variance were performed in order to determine whether main or interaction effects of Gender and Work Status were present. These tests were conducted when examining: (a) the degree of differentiation present in participants' responses, (b) participants' ratings of the degree of improvement/decline expected in a list of pharmacy-related abilities, (c) participants' ratings of the degree of difficulty/ease associated with overcoming problems in a list of pharmacy-related duties, (d) the frequency with which participants chose the five forms of compensation, and (e) participants' ratings of the perceived effectiveness of the forms of compensation.

In order to determine whether or not Gender was a significant factor, Age X Expertise X Gender MANOVAs were carried out. The Expertise factor was included in all analyses where the data from both pharmacists and novices was available. In analyses where the data from pharmacists only were involved, Age X Gender MANOVAs were completed. Separate analyses were conducted in order to examine whether the work status of participants was a significant factor. For these analyses, however, only the older participants were included, as they were more likely than middle-aged and younger participants to have some degree of variability with respect to retirement. Because the data used in these analyses pertained only to the older participants, analyses did not contain an Age factor. Therefore, either Expertise X Work Status MANOVAs were carried out (i.e., in cases where data from all participants were available), or single-factor (Work Status) MANOVAs were completed (i.e., when the data from pharmacists only were available).

The conclusion that gender and work status do not play a significant role was drawn after having performed more than 60 separate preliminary analyses. The majority of these analyses were performed when dealing with measures of the degree of differentiation present in participants' responses (approximately 50 analyses). These analyses were distributed in the following three categories. First, the three measures of differentiation were investigated separately for the presence of Gender or Work Status main effects (or interactions) in relation to three separate questions. These questions were: (a) what abilities *change* across time; (b) what abilities specifically *decline* across time; and, (c) what abilities specifically *improve* across time? Approximately 16 analyses were conducted in this category (11 at the macro-level, 5 at the micro-level). Second, the tests for Gender or Work Status Main effects (or interactions) were also carried out on different arrangements of the three measures of differentiation. For example, in some cases, the number of personal elaborations was added to the number of knowledge elaborations in order to arrive at a measure of the *total* number of elaborations produced. Approximately 10 analyses were conducted in this category. Third, in order to perform analyses designed to determine whether Work Status main effects (or interactions) were present, it was necessary to use the data pertaining to older participants only. Therefore, these analyses (roughly 25 in total) had to be performed apart from the other preliminary analyses discussed above.

Approximately 10 additional analyses were performed in order to determine whether or not Gender or Work Status main effects (or interactions) were present in the following areas: (a) participants' ratings of the degree of improvement/decline expected in a list of pharmacy-related abilities, as well as (b) participants' ratings of the degree of difficulty/ease associated with overcoming problems in a list of pharmacy-related duties, (c) the frequency with which participants chose the five forms of compensation, and (e) participants' ratings of the perceived effectiveness of the forms of compensation.

In all of the preliminary analyses carried out, no reliable main effects for Gender or Work

Status were observed (i.e., there was only one significant main effect of Gender, and one significant main effect of Work Status). Therefore, all of the results presented below are based on the combined data of male and female participants, as well as those participants who were employed and retired.

Participants' Implicit Theories of Aging

Beliefs About Work-Related Abilities Expected to Change

Participants were first asked to generate the work-related abilities which they expected to change for the aging pharmacist. In order to systematically examine the content of participants' beliefs, responses were analyzed to determine which belief categories were mentioned. Belief categories were divided into those that were (a) decline-oriented (i.e., visual decline, auditory decline, tactile decline, mobility decline, memory decline, other cognitive functioning decline, less expertise related to the pharmacist role, less patience, less expertise in dealing with customers, less expertise at managerial things), (b) improvement-oriented (i.e., more expertise related to the pharmacy role, more patience, more expertise related to dealing with customers, more expertise related to dealing with managerial things), and (c) other (i.e., beliefs which did not belong to either of the above decline- or improvement-oriented categories). The percentage of participants mentioning each of the above belief categories was then calculated. Table 1 presents the percentages of all participants mentioning each decline and improvement-oriented belief category. The information is summarized in an Age X Expertise format. Using the calculated percentages, the sets of decline and improvement-oriented belief categories were each rank-ordered from most mentioned, to least often mentioned.

A 3 X 2 X 2 (Age X Expertise X Direction) repeated measures MANOVA was then performed. The dependent measures were the total number of decline-oriented beliefs (combined across all decline-oriented belief categories) and the total number of improvement-oriented beliefs

Table 1

Percentage of Participants (Age X Expertise) Mentioning Specific Beliefs When Discussing Changes Expected to Occur in the Aging Pharmacist

Beliefs	Pharmacists			Novices		
	Younger (n = 21)	Middle-Aged (n = 28)	Older (n = 23)	Younger (n = 21)	Middle-Aged (n = 27)	Older (n = 17)
Decline-Oriented						
Visual decline	23.8 (3)	39.3 (3)	17.4 (4)	38.1 (3)	55.5 (1)	47.1 (2)
Auditory decline	23.8 (3)	25.0 (5)	8.7 (5)	19.1 (5)	18.5 (5)	29.4 (4)
Tactile decline	9.5 (5)	10.7 (6)	17.4 (4)	0.0 (8)	0.0 (8)	0.0 (7)
Mobility decline	42.9 (2)	46.4 (2)	56.5 (1)	33.3 (4)	40.7 (2)	35.3 (3)
Memory decline	19.0 (4)	28.6 (4)	21.7 (3)	47.6 (1)	33.3 (3)	52.9 (1)
Cognitive decline	47.6 (1)	50.0 (1)	47.8 (2)	9.5 (6)	7.4 (7)	5.9 (6)
Less expertise related to pharmacist role	0.0 (6)	0.0 (7)	4.3 (6)	42.9 (2)	29.6 (4)	17.6 (5)
Less patience	0.0 (6)	10.7 (6)	0.0 (6)	4.8 (7)	0.0 (8)	0.0 (7)
Less customer expertise	0.0 (6)	0.0 (7)	0.0 (6)	9.5 (6)	17.4 (6)	5.9 (6)
Less managerial expertise	0.0 (6)	0.0 (7)	0.0 (6)	0.0 (8)	0.0 (8)	0.0 (7)
Improvement-Oriented						
More expertise related to pharmacist role	33.3 (1)	17.9 (1)	4.3 (2)	19.0 (1)	14.8 (2)	11.8 (2)

cont.

	Pharmacists			Novices		
Beliefs	Younger	Middle-Aged	Older	Younger	Middle-Aged	Older
More patience	0.0 (4)	0.0 (3)	4.3 (2)	4.8 (3)	7.4 (3)	0.0 (4)
More customer expertise	23.8 (2)	7.1 (2)	13.0 (1)	9.5 (2)	7.4 (3)	5.9 (3)
More managerial expertise	0.0 (4)	0.0 (3)	0.0 (3)	0.0 (4)	0.0 (4)	0.0(4)
Other	9.5 (3)	7.1 (2)	4.3 (2)	0.0 (4)	44.4 (1)	41.2 (1)

Note. Rank orderings appear in parentheses and are listed separately for decline-oriented beliefs and improvement-oriented beliefs.

(combined across improvement-oriented belief categories). The between-subjects factors were Age and Expertise. The within-subjects factor (Direction) had two levels. The first level was represented by the total number of decline-oriented beliefs. The second level was represented by the total number of improvement-oriented beliefs. It should be noted that in certain cases, some groups failed to mention a particular belief category (as indicated in Table 1 by a percentage equal to zero). For example, the belief category "tactile decline" was not produced by any novice participant. In carrying out the repeated measures MANOVA, only those belief categories with non-zero percentages were included. Therefore, the following decline-oriented belief categories were used in order to calculate the total number of decline-oriented beliefs: visual decline, auditory decline, mobility decline, memory decline, and other cognitive functioning decline. Similarly, the following improvement-oriented belief categories were used in order to calculate the total number of improvement-oriented beliefs: more pharmacist expertise, and more customer expertise. Results revealed a significant within-subjects effect, Wilks' criterion $F(1, 127) = 133.98$, $p < .001$. Participants mentioned decline-oriented belief categories ($M = 1.68$ beliefs, $SD = 1.18$) more often than improvement-oriented beliefs ($M = 0.29$ beliefs, $SD = 0.56$). No other effects were significant.

Beliefs About Work-Related Abilities Expected to Decline or Improve

Pharmacists only were also asked two follow-up probes related to the earlier question which asked for beliefs about what work-related abilities were believed to change for the aging pharmacist. First, participants were asked to specify what work-related abilities they expected to decline for the aging pharmacist. The second question asked the participants what specific work-related abilities would improve for the aging pharmacist.

Decline-Oriented Beliefs. Table 2 shows the percentage of younger, middle-aged, and older pharmacists who mentioned each decline-oriented belief category. By using the calculated percentages the belief categories were rank-ordered from most often mentioned, to least mentioned.

Table 2

Percentage of Younger, Middle-Aged and Older Pharmacists Mentioning Decline-Oriented Belief Categories When Specifically Asked for Beliefs About What Abilities Decline in the Aging Pharmacist

Overall Rank-Ordering of Decline-Oriented Beliefs	Age Group: Younger (n = 21)	Middle-Aged (n = 28)	Older (n = 23)
(1) Mobility decline	33.3 (2)	42.9 (1)	43.5 (1)
(2) Cognitive decline	42.9 (1)	21.4 (2)	21.7 (2)
(3) Visual decline	33.3 (2)	14.3 (3)	21.7 (2)
(4) Memory decline	28.6 (3)	21.4 (2)	13.0 (3)
(5) Auditory decline	14.3 (4)	14.3 (3)	21.7 (2)
(6) Less patience	9.5 (5)	7.1 (5)	13.0 (3)
(7) Less expertise related to pharmacist role	4.8 (6)	10.7 (4)	0.0 (5)
(8) Other	4.8 (6)	7.1 (5)	0.0 (5)
(9) Tactile decline	4.8 (6)	0.0 (7)	4.3 (4)
(10) Less customer expertise	0.0 (7)	3.6 (6)	0.0 (5)
(11) Less managerial expertise	0.0 (7)	0.0 (7)	0.0 (5)

Note. Rank orderings appear in parentheses

Improvement-Oriented Beliefs. Table 3 shows the percentage of younger, middle-aged, and older pharmacists who mentioned each improvement-oriented belief category. Again, using the calculated percentages, the belief categories were rank-ordered.

Differentiation of Participants' Beliefs

The degree of differentiation of participants' beliefs was examined at two levels. The macro-level analyses involved examining the total number of words used to describe participants' beliefs. In addition, this level of analysis examined the total number of elaborations produced (both knowledge and personal) by participants in relation to: (a) decline-oriented belief categories (e.g., visual decline, auditory decline); (b) improvement-oriented belief categories (e.g., more expertise related to the pharmacist role, more patience); as well as (c) the combination of decline and improvement-oriented belief categories. The second set of analyses were conducted at a micro-level. Here, analyses focussed on the number of knowledge and personal elaborations produced for each of the specific decline- and improvement-oriented belief categories.

Beliefs About Changes in the Aging Pharmacists' Abilities.

Macro-Level Results. A 3 x 2 (Age x Expertise) ANOVA was performed on the total number of words used in the participants' descriptions of the expected changes in the work-related abilities of the aging pharmacist. Results revealed a significant main effect of Expertise, $F(1, 128) = 5.36$, $MSE = 169754.90$, $p < .05$. Pharmacists used a greater number of words to describe their beliefs ($M = 243.7$, $SD = 216.8$) than did novices ($M = 166.9$, $SD = 125.7$). No other effects were significant.

A 3 X 2 (Age X Direction) repeated measures MANOVA was also performed on the total number of words produced by pharmacists only in describing decline- and improvement-oriented beliefs. These data were not available for novices. Therefore, the between-subjects factor was represented by Age. The within-subjects factor (Direction) was comprised of two levels (i.e., the

Table 3

Percentage of Younger, Middle-Aged and Older Pharmacists Mentioning Improvement-Oriented Belief Categories When Specifically Asked for Beliefs About What Abilities Improve in the Aging Pharmacist

Overall Rank-Ordering of Improvement-Oriented Beliefs	Age Group		
	Younger (n = 21)	Middle-Aged (n = 28)	Older (n = 23)
(1) More customer expertise	81.0 (1)	75.0 (1)	52.2 (2)
(2) More expertise related to pharmacist role	52.4 (2)	57.1 (2)	60.9 (1)
(3) More patience	19.0 (3)	14.3 (3)	8.7 (3)
(4) More managerial expertise	4.8 (4)	3.6 (4)	0.0 (5)
(5) Other	0.0 (5)	0.0 (5)	4.3 (4)

Note. Rank orderings appear in parentheses.

total number of decline-oriented words produced and the total number of improvement-oriented words produced). Results revealed a significant within-subjects main effect, $F(1, 64) = 23.44$, $p < .001$. More words were used to describe decline-oriented categories ($M = 151.40$, $SD = 159.41$) as opposed to improvement-oriented categories ($M = 40.12$, $SD = 107.14$). No other effects were significant.

For each participant, the total number of knowledge and personal elaborations were computed for the decline-oriented and improvement-oriented belief categories. Turning first to beliefs about decline, a 3 x 2 (Age X Expertise) ANOVA was performed on the total number of personal elaborations produced for the decline-oriented belief categories. A main effect of Expertise was found, $F(1, 126) = 23.25$, $MSE = 8.63$, $p < .001$. Pharmacists ($M = 0.57$, $SD = 0.82$) produced more personal elaborations than did novices ($M = 0.05$, $SD = 0.21$). No other effects were significant. Analyses examining the total number of decline-oriented knowledge elaborations produced failed to reveal significant findings. Finally, a 3 x 2 (Age X Expertise) ANOVA performed on the combined decline-oriented elaborations (both knowledge and personal) failed to reveal significant findings.

With respect to the total number of improvement-oriented elaborations, separate analyses on the total number of knowledge and personal elaborations failed to reveal significant results. As well, when both types of improvement-oriented elaborations were combined, analyses failed to show significant findings. Further, the total number of elaborations (both knowledge and personal) for decline and improvement-oriented belief categories were calculated for each participant. A 3 x 2 (Age X Expertise) ANOVA failed to display any significant findings.

Finally, an analysis was performed in order to investigate whether the direction of beliefs (i.e., either improvement-oriented or decline-oriented) interacted with age or expertise. For each participant, the total number of decline-oriented elaborations was calculated (both knowledge and personal), as well as the total number of improvement-oriented elaborations (both knowledge and personal). A 3 X 2 X 2 (Age X Expertise X Direction) repeated measures MANOVA was performed, where the within-subjects factor was represented by the direction of participants' beliefs. A between-subjects effect of Expertise was found, $F(1,126) = 3.84$, $p < .05$. Pharmacists produced a greater total number of elaborations (M=3.01, SD = 2.21) than did novices (M = 2.57, SD = 1.46). A significant within-subjects effect was also observed, $F(1,126) = 139.63$, $p<.001$. Decline-oriented elaborations (M = 2.20, SD = 1.44) were produced more often than improvement-oriented elaborations (M = 0.41, SD = 1.02). No other effects were significant.

Micro-Level Results. Two dependent measures were examined in reference to the decline and improvement-oriented belief categories: the number of personal elaborations produced and the number of knowledge elaborations produced. The number of words produced per belief category was not available.

A 3 x 2 (Age X Expertise) MANOVA was performed in which the set of dependent variables was the number of personal elaborations produced by participants for each belief category. An initial examination of the cell means revealed that personal elaborations were produced infrequently. The analyses revealed that all cell means were less than 1.0. Therefore, the analyses are not interpreted further. They are reported here, however, for possible comparison with knowledge elaborations. The results yielded a significant multivariate main effect of Expertise, Wilks' criterion $F(11, 116) = 2.50$, $p < .01$. Univariate tests showed that pharmacists produced more personal elaborations (M = 0.10, SD = 0.31) than novices (M = 0.00, SD = 0.00) when discussing beliefs about visual decline, $F(1, 126) = 6.56$, $MSE = 0.05$, $p < .05$. Pharmacists also generated more personal elaborations with reference to beliefs about mobility decline (M = 0.09, SD = 0.29) than novices (M = 0.02, SD = 0.12), $F(1, 126) = 4.27$, $MSE = 0.05$, $p < .05$. As well, pharmacists (M = 0.18, SD = 0.46) produced a greater number of personal elaborations when discussing cognitive decline than novices (M = 0.00, SD = 0.00), $F(1, 126) = 9.66$, MSE = 0.11, $p < .01$. It should be noted that a marginally significant difference was observed in which pharmacists (M = 0.08, SD = 0.33) generated more personal elaborations than novices (M = 0.00, SD = 0.00) with regards to memory decline, $F(1, 126) = 3.89$, MSE = 0.06, $p = .051$.

An Age X Expertise MANOVA was also performed on the number of knowledge elaborations produced by all participants. The results showed a significant multivariate main effect of Expertise, Wilks' criterion $F(13, 114) = 10.40$, $p < .001$. Table 4 presents the results of the univariate tests in which pharmacists and novices differed significantly in the number of knowledge elaborations produced. Whereas pharmacists produced more knowledge elaborations for the categories of "cognitive decline," novices produced more for the categories of "visual decline", "memory decline", and "less pharmacist expertise."

As the means for the univariate comparisons above were quite low, the total number of elaborations (both knowledge and personal) was calculated per belief category. A 3 X 2 (Age X Expertise) MANOVA was performed on this measure. A significant multivariate main effect of Expertise was observed, Wilks' criterion $F(13, 114) = 9.04$, $p<.001$. Table 5 displays those univariate tests which revealed significant differences in the mean total number of elaborations produced per belief category between pharmacists and novices, as well as those tests which approached significance. Pharmacists produced significantly more elaborations than novices for the categories of "mobility decline" and "other cognitive decline." In contrast, novices produced more elaborations than pharmacists for the categories of "less pharmacist expertise" and "other." In cases where the results approached significance, pharmacists produced more elaborations than novices for the category "more customer expertise," whereas novices produced more for the category "visual decline." The multivariate interaction (Age X Expertise) was marginally significant as well, Wilks' criterion $F(26, 230) = 1.43$, $p=.09$. Table 6 shows those univariate tests where the mean total

Table 4

Mean Number of Knowledge Elaborations Produced by Pharmacists and Novices When Discussing Beliefs About Abilities Expected to Change

		Occupation		$F(1, 126)$	P-Value
Specific Beliefs		Pharmacists	Novices		
Cognitive decline	a	0.51 (0.72)	0.08 (0.27)	20.52	$p < .005$
Tactile decline	a	0.09 (0.29)	0.00 (0.00)	6.11	$p < .05$
Visual decline	b	0.21 (0.44)	0.48 (0.50)	10.26	$p < .005$
Memory decline	b	0.25 (0.53)	0.43 (0.50)	5.35	$p < .05$
Less expertise related to pharmacy	b	0.01 (0.12)	0.31 (0.47)	23.14	$p < .001$
Less customer expertise	b	0.00 (0.00)	0.08 (0.27)	5.10	$p < .05$
Other	b	0.01 (0.12)	0.29 (0.46)	25.66	$p < .001$

Note. Standard deviations in parentheses.

[a] Pharmacists > Novices

[b] Novices > Pharmacists

Table 5

Mean Total Number of Elaborations Produced by Pharmacists and Novices Per Belief Category When Discussing Beliefs About Abilities Expected to Change

		Occupation		$F(1, 126)$	P-Value
Specific Beliefs		Pharmacists	Novices		
Tactile decline	[a]	0.15 (0.40)	0.00 (0.00)	8.54	$p < .01$
Mobility decline	[a]	0.60 (0.72)	0.38 (0.52)	4.79	$p < .005$
Other cognitive decline	[a]	0.69 (0.89)	0.08 (0.27)	28.17	$p < .001$
Less expertise related to pharmacy	[a]	0.01 (0.12)	0.31 (0.47)	28.14	$p < .001$
Less customer expertise	[a]	0.00 (0.00)	0.08 (0.27)	5.10	$p < .05$
Other	[a]	0.09 (0.33)	0.29 (0.46)	8.72	$p < .005$
Visual decline	[b]	0.31 (0.53)	0.48 (0.50)	3.45	$p = .07$
More customer expertise	[b]	0.21 (0.56)	0.08 (0.27)	3.07	$p = .08$

Note. Standard deviations in parentheses.

[a] Significant difference

[b] Approaching significance difference

Table 6

Mean Total Number of Elaborations Produced by Pharmacists and Novices Per Belief Category When Discussing Beliefs About Abilities Expected to Change

	Age Group						$F(1, 126)$	P-Value
Beliefs	Younger		Middle-Aged		Older			
	Pharm.	Nov.	Pharm.	Nov.	Pharm.	Nov.		
Less patience [b]	0.00	0.05	0.15	0.00	0.00	0.00	2.62	$p < .08$
	(0.00)	(0.22)	(0.46)	(0.00)	(0.00)	(0.00)		
Other [a]	0.10	0.00	0.12	0.44	0.05	0.42	4.83	$p < .05$
	(0.31)	(0.00)	(0.43)	(0.51)	(0.21)	(0.51)		

Note. Standard deviations in parentheses.

[a] Significant difference

[b] Approaching significance difference

number of elaborations were significantly different or approaching significance. The means are too low to interpret.

Beliefs About Decline in the Aging Pharmacist's Abilities

As mentioned previously, only the pharmacists were asked a follow-up question which specifically probed for beliefs about the work-related abilities that were expected to decline for the aging pharmacist. Both macro- and micro-level analyses were conducted.

Macro-Level Results. A single-factor (Age) ANOVA was performed on the total number of words used to describe pharmacists' decline-oriented beliefs. This analysis failed to reveal significant age differences. Younger (M = 134.00 SD = 105.76), middle-aged (M = 140.48 SD = 156.73) and older (M = 141.85 SD = 93.45) pharmacists produced a similar number of words. The number of decline-oriented personal and knowledge elaborations were totalled for each participant. A single-factor (Age) ANOVA was carried out on the total number of decline-oriented knowledge elaborations produced by younger, middle-aged and older pharmacists. A significant main effect was observed, $F(2, 54) = 3.75$, $MSE = 1.61$, $p < .05$. Scheffé's post-hoc tests revealed that older pharmacists produced more decline-oriented knowledge elaborations (M = 2.85, SD = 1.52) than middle-aged pharmacists (M = 1.68, SD = 1.28), $p < .05$. Younger pharmacists (M = 1.89, SD = 1.05) did not significantly differ from either of the two older age groups. In contrast, no significant age differences were found when examining the total number of decline-oriented personal elaborations (M younger = 0.05, SD = 0.23; M middle-aged = 0.08, SD = 0.28; M older = 0.08 SD = 0.28).

However, a single-factor (Age) ANOVA performed on the total number of decline-oriented elaborations (both knowledge and personal combined) revealed significant age differences, $F(2, 54) = 3.70$, $MSE = 1.64$, $p < .05$. Scheffé's post-hoc tests indicated that older pharmacists produced more decline-oriented elaborations (M = 2.92, SD = 1.50) than middle-aged pharmacists (M = 1.76, SD = 1.33), $p < .05$. Younger pharmacists (M = 1.95, SD = 1.03) did not differ significantly from either of the two older age groups.

Micro-Level Results. A series of three single-factor (Age) MANOVAs were performed which compared younger, middle-aged, and older pharmacists. In the first analysis, the set of dependent variables was the number of words produced per decline-oriented belief category (see Table 7 for the mean number of words produced per decline-oriented belief category). In the second analysis the set of dependent variables was the number of knowledge elaborations produced per decline-oriented belief category (see Table 8 for the means). For the third analysis the dependent variables were the number of personal elaborations produced per decline-oriented belief category (see Table 9 for the means). In all three analyses, no significant age differences were observed.

Beliefs About Improvements in the Aging Pharmacist's Abilities

Only the pharmacists were asked a follow-up question which specifically probed for beliefs about the work-related abilities which they expected to improve for the aging pharmacist. Both macro- and micro-level analyses were performed.

Macro-Level Results. A single-factor (Age) ANOVA was conducted which compared younger, middle-aged, and older pharmacists on the total number of words (i.e., collapsed across all improvement-oriented belief categories) produced when describing improvement-oriented beliefs. No significant age differences were found. Younger (M = 109.40, SD = 94.25), middle-aged (M = 143.50, SD = 192.66) and older (M = 109.63, SD = 74.12) pharmacists produced the same number of words when describing improvement-oriented beliefs. Further, a single-factor (Age) ANOVA performed on the total number of improvement-oriented knowledge elaborations (collapsed across improvement-oriented belief categories) failed to reveal significant age differences (M younger = 1.75, SD = 0.85; M middle-aged = 1.81, SD = 0.80; M older = 1.74, SD = 0.93). Similarly, a single-factor (Age) ANOVA carried out on the total number of improvement-oriented personal elaborations

Table 7

The Mean Number of Words Used by Pharmacists to Describe Decline-Oriented Beliefs Per Decline-Oriented Belief Category

	Age Group		
Decline-Oriented Beliefs	Younger	Middle-Aged	Older
Visual decline	9.26 (15.92)	1.52 (5.13)	12.54 (30.52)
Auditory decline	1.74 (4.39)	1.56 (5.02)	8.00 (11.92)
Tactile decline	1.26 (5.51)	0.00 (0.00)	3.23 (11.65)
Mobility decline	26.79 (58.75)	25.48 (49.37)	30.62 (28.27)
Memory decline	12.58 (31.80)	8.92 (20.92)	9.85 (26.40)
Cognitive decline	29.26 (46.06)	21.72 (56.83)	29.38 (45.41)
Less expertise related to pharmacist role	5.89 (25.69)	8.64 (28.09)	0.00 (0.00)
Less patience	8.95 (31.21)	1.76 (6.12)	12.85 (30.94)
Less customer expertise	0.00 (0.00)	0.76 (3.80)	0.00 (0.00)
Less managerial expertise	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)

cont.

	Age Group		
Decline-Oriented Beliefs	Younger	Middle-Aged	Older
Other decline	9.05 (39.46)	6.92 (27.18)	0.00 (0.00)

Note. Standard deviations appear in parentheses

Table 8

The Mean Number of Knowledge Elaborations Used by Pharmacists to Describe Decline-Oriented Beliefs Per Decline-Oriented Belief Category

	Age Group		
Decline-Oriented Beliefs	Younger	Middle-Aged	Older
Visual decline	0.37 (0.50)	0.16 (0.37)	0.38 (0.51)
Auditory decline	0.16 (0.37)	0.16 (0.37)	0.46 (0.66)
Tactile decline	0.05 (0.23)	0.00 (0.00)	0.08 (0.28)
Mobility decline	0.37 (0.50)	0.48 (0.51)	0.85 (0.55)
Memory decline	0.32 (0.48)	0.24 (0.44)	0.23 (0.44)
Cognitive decline	0.42 (0.51)	0.24 (0.44)	0.62 (0.96)
Less expertise related to pharmacist role	0.05 (0.23)	0.20 (0.65)	0.00 (0.00)
Less patience	0.11 (0.32)	0.08 (0.28)	0.23 (0.44)
Less customer expertise	0.00 (0.00)	0.04 (0.20)	0.00 (0.00)
Less managerial expertise	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)

cont.

	Age Group		
Decline-Oriented Beliefs	Younger	Middle-Aged	Older
Other decline	0.05 (0.23)	0.08 (0.28)	0.00 (0.00)

Note. Standard deviations appear in parentheses

Table 9

The Mean Number of Personal Elaborations Used by Pharmacists to Describe Decline-Oriented Beliefs Per Decline-Oriented Belief Category

	Age Group		
Decline-Oriented Beliefs	Younger	Middle-Aged	Older
Visual decline	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Auditory decline	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Tactile decline	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Mobility decline	0.00 (0.00)	0.04 (0.20)	0.00 (0.00)
Memory decline	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Cognitive decline	0.05 (0.23)	0.04 (0.20)	0.00 (0.00)
Less expertise related to pharmacist role	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Less patience	0.00 (0.00)	0.00 (0.00)	0.08 (0.28)
Less customer expertise	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Less managerial expertise	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)

cont.

	Age Group		
Decline-Oriented Beliefs	Younger	Middle-Aged	Older
Other decline	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)

Note. Standard deviations appear in parentheses

(collapsed across improvement-oriented belief categories) failed to indicate significant age differences (M younger = 0.05, SD = 0.22; M middle-aged = 0.15, SD = 0.37; M older = 0.11, SD = 0.32). Finally, a single-factor (Age) ANOVA performed on the total number of improvement-oriented elaborations (both knowledge and personal combined). No significant age differences were observed (M younger = 1.80, SD = 0.89; M middle-aged = 1.96, SD = 0.88; M older = 1.84, SD = 0.90).

Micro-Level Results. Three single-factor (Age) MANOVAs were performed which compared younger, middle-aged, and older pharmacists. In the first analysis, the set of dependent variables was the number of words produced per improvement-oriented belief category (see Table 10 for the mean number of words produced per improvement-oriented belief category). In the second analysis the set of dependent variables was the number of knowledge elaborations produced per improvement-oriented belief category (see Table 11 for the means). For the third analysis the dependent variables were the number of personal elaborations produced per improvement-oriented belief category (see Table 12 for the means). In all three analyses, no significant age differences were observed.

Additionally, a 3 X 2 (Age X Direction) repeated measures MANOVA was performed, where the within-subjects factor was represented by the direction of the pharmacists' beliefs (i.e., either improvement- or decline-oriented). For each pharmacist, the total number of decline-oriented elaborations was calculated (both knowledge and personal), as well as the total number of improvement-oriented elaborations (both knowledge and personal). A between-subjects effect of Age was observed to be marginally significant, $F(2, 54) = 2.59$, $p = .08$. Although Scheffé's post-hoc tests failed to reveal significant differences between any of the age groups, older pharmacists (M = 5.00, SD = 2.27) produced a greater number of total elaborations as compared to younger pharmacists (M = 3.79, SD = 1.40) and middle-aged pharmacists (M = 3.68, SD = 1.75).

Table 10

The Mean Number of Words Used by Pharmacists to Describe Improvement-Oriented Beliefs Per Improvement-Oriented Belief Category

	Age Group		
Improvement-Oriented Beliefs	Younger	Middle-Aged	Older
More expertise related to pharmacist role	51.20 (74.97)	62.81 (121.35)	43.11 (57.87)
More patience	12.75 (38.06)	4.35 (14.92)	0.63 (2.01)
More customer expertise	50.35 (48.19)	62.31 (99.98)	37.05 (37.16)
More managerial expertise	1.35 (6.04)	0.65 (3.33)	0.00 (0.00)
Other	0.00 (0.00)	0.00 (0.00)	2.11 (9.18)

Note. Standard deviations appear in parentheses

Table 11

The Mean Number of Knowledge Elaborations Used by Pharmacists to Describe Improvement-Oriented Beliefs Per Improvement-Oriented Belief Category

	Age Group		
Improvement-Oriented Beliefs	Younger	Middle-Aged	Older
More expertise related to pharmacist role	0.65 (0.67)	0.77 (0.76)	0.89 (0.74)
More patience	0.20 (0.41)	0.12 (0.33)	0.11 (0.32)
More customer expertise	0.85 (0.37)	0.88 (0.59)	0.68 (0.58)
More managerial expertise	0.05 (0.22)	0.04 (0.20)	0.00 (0.00)
Other	0.00 (0.00)	0.00 (0.00)	0.05 (0.23)

Note. Standard deviations appear in parentheses

Table 12

The Mean Number of Personal Elaborations Used by Pharmacists to Describe Improvement-Oriented Beliefs Per Improvement-Oriented Belief Category

	Age Group		
Improvement-Oriented Beliefs	Younger	Middle-Aged	Older
More expertise related to pharmacist role	0.05 (0.22)	0.04 (0.20)	0.05 (0.23)
More patience	0.00 (0.00)	0.08 (0.27)	0.00 (0.00)
More customer expertise	0.00 (0.00)	0.04 (0.20)	0.05 (0.23)
More managerial expertise	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Other	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)

Note. Standard deviations appear in parentheses

As well, a marginally significant Age X Direction interaction effect was also observed, $F(2, 54) = 2.54$, $MSE = 2.18$, $p = .09$. Table 13 lists the mean number of total elaborations produced per belief category according to age and the direction of beliefs. As can be seen in the table, younger and middle-aged pharmacists produced equal numbers of elaborations for improvement- and decline-oriented beliefs. In contrast, older pharmacists produced a substantially greater number of decline-oriented elaborations than they did improvement-oriented elaborations.

One final analysis was performed in an effort to examine whether the direction of participants' beliefs interacted with age. For each pharmacist, the total number of words used to express decline-oriented beliefs was calculated, as well as the total number of words used to express improvement-oriented beliefs. A 3 X 2 (Age X Direction) repeated measures MANOVA was performed, where the within subjects factor was represented by the direction of the pharmacists' beliefs. None of the effects reached significance.

Developmental Direction of Beliefs

Pharmacists were asked for their beliefs about the degree to which a list of pharmacy-related abilities would improve or decline as the average pharmacist ages. A single-factor (Age) MANOVA which compared all three age groups was performed on the ratings of improvement or decline (i.e., the developmental direction). A significant Age effect was observed, Wilks' criterion $F(48, 68) = 1.90$, $p = .007$. Table 14 presents the mean ratings of improvement or decline in the areas which showed significant differences between younger, middle-aged, and older pharmacists.

As the list of pharmacy-related abilities was quite lengthy (24 in total), a pre-determined categorization of these abilities (produced by this author's thesis advisor) was utilized in order to complete further analyses. This categorization produced seven clusters of pharmacy-related abilities. Table 15 shows the specific pharmacy-related abilities which fall into the following seven clusters:

Table 13

Mean Total Number of Elaborations Produced by Younger, Middle-Aged and Older Pharmacists According to the Direction of Beliefs (Improvement-Oriented or Decline-Oriented)

Age Group					
Younger		Middle-Aged		Older	
Improve	Decline	Improve	Decline	Improve	Decline
1.80 (0.89)	1.95 (1.03)	1.96 (0.87)	1.76 (1.33)	1.84 (0.90)	2.92 (1.50)

Note. Standard deviations in parentheses.

Table 14

Mean Pharmacist Ratings of the Developmental Direction of Pharmacy-Related Abilities by Age

	Age Group		
	Younger	Middle-Aged	Older
Knowledge of regular customers	1.25* (0.44)	1.68* (0.63)	1.50 (0.60)
Knowledge of how the business is run	1.35* (0.59)	1.50 (0.58)	1.95* (0.90)
Ability to operate new technologies	3.70 (0.66)	3.69 (0.55)	3.64 (0.66)
Awareness of new drugs on the market	3.65 (0.59)	3.27 (0.83)	3.05 (1.03)
Remembering item locations in pharmacy	2.90 (0.91)	3.08 (0.69)	3.09 (0.61)
Ability to give advice about over-the-counter drugs	2.75 (1.02)	2.28 (0.74)	2.30 (0.92)
Communicating effectively with customers	1.75 (0.72)	1.92 (0.69)	1.77 (1.07)
Knowledge of local physicians	1.75 (1.12)	1.68 (0.63)	2.23 (0.81)
Ability to read hand-written prescriptions	2.70 (0.92)	2.23 (0.86)	2.18 (1.10)
Speed at filling prescriptions	3.55 (0.76)	3.54 (0.90)	3.59 (0.80)
Communicating effectively with older adults	1.75 (0.55)	1.65 (0.63)	1.50 (0.60)
Errors in filling prescriptions	3.55 (0.60)	3.15 (0.67)	3.32 (0.84)
Absenteeism	3.55* (0.60)	2.84* (0.62)	2.62 (0.80)
Ability to delegate to assistants or younger pharmacists	2.11 (0.88)	2.24 (0.93)	2.14 (0.89)

cont.

	Age Group		
	Younger	Middle-Aged	Older
Punctuality	2.75 (0.72)	2.52 (0.71)	2.18 (0.91)
Reliability	2.50 (0.76)	2.46 (0.65)	2.18 (1.01)
Speed at locating items in the pharmacy	3.20 (0.76)	2.92 (0.84)	3.32 (0.57)
Knowledge of ethics and regulations	3.25* (0.91)	2.73 (0.72)	2.36* (0.95)
Empathy with customer	2.10 (0.72)	2.00 (0.76)	1.77 (0.53)
Ability to adapt to changes in the pharmacy or the profession	4.10* (0.31)	3.96 (0.61)	3.55* (0.74)
Ability to follow written directions and instructions	3.30* (0.57)	2.96 (0.61)	2.73* (0.77)
Patience	2.60 (0.75)	2.27 (0.96)	2.59 (1.14)
Ability to express instructions orally	2.30 (0.66)	2.19 (0.57)	2.36 (0.85)
Ability to train assistants and younger pharmacists	2.70 (1.03)	2.24 (0.72)	2.59 (0.96)

Note. Ratings of improvement or decline were indicated on a scale ranging from 1 (much better with aging) to 5 (much worse with aging). Standard deviations are shown in parentheses.

* $p < .05$ (Scheffé post-hoc). For the ability "absenteeism," younger pharmacists indicated ratings which were significantly different than middle-aged pharmacists, and older pharmacists.

Table 15

Seven Clusters of Ability Along with the Associated Pharmacy-Related Abilities Which Fall into Each Cluster

Cluster	Associated Pharmacy-Related Abilities
Local Knowledge	Knowledge of regular customers
	Knowledge of how the business is run
	Knowledge of local physicians
Communication	Communicating effectively with older adults
	Communicating effectively with customers
	Ability to express instructions orally
	Ability to give advice about over-the-counter drugs
	Empathy with customers
	Patience
Administration	Ability to train assistants and younger pharmacists
	Ability to delegate to assistants or younger pharmacists
Professional Responsibility	Punctuality
	Reliability
	Absenteeism

cont.

Cluster	Associated Pharmacy-Related Abilities
Cognitive	Ability to read handwritten prescriptions
	Ability to follow written directions and instructions
	Remembering where specific items are in the pharmacy
Speeded Performance	Speed at filling prescriptions
	Speed at locating items in the pharmacy
Updating	Awareness of new drugs on the market
	Ability to operate new technologies
	Knowledge of ethics and regulations
	Ability to adapt to changes in the pharmacy or profession

Local knowledge, communication, administration, professional responsibility, cognitive, speeded performance, and updating. For each cluster, an average rating (i.e., of the developmental direction) was obtained for each pharmacist. To illustrate this process, for the cluster "Local Knowledge," the ratings for the following pharmacy-related abilities were added and divided by three: knowledge of regular customers, knowledge of how the business is run, and knowledge of local physicians. This averaging process was repeated for each of the seven clusters. A 3 X 7 (Age X Cluster) MANOVA was performed on the average ratings (i.e., the developmental directional ratings) for each cluster of pharmacy-related abilities. Results revealed a significant multivariate Age X Cluster interaction, Wilks' criterion $F(12, 102) = 4.09$, $p < .01$. Table 16 presents the mean ratings per cluster for each of the three age groups. Univariate tests revealed that for the cluster "Local Knowledge," younger pharmacists held significantly more favourable developmental beliefs ($M = 1.45$, $SD = 0.51$) than older pharmacists ($M = 1.60$, $SD = 0.37$), $F(2, 64) = 4.84$, $p < .05$. In contrast, for the cluster "Professional Responsibility," older pharmacists believed that these type of pharmacy-related abilities would show significantly higher degrees of age-related improvement ($M = 2.33$, $SD = 0.71$) than did younger pharmacists ($M = 2.93$, $SD = 0.47$), $F(2, 62) = 5.30$, $p < .01$. Finally, for the cluster "Updating," older pharmacists held significantly more favourable developmental beliefs ($M = 3.18$, $SD = 0.49$) than did younger pharmacists ($M = 3.42$, $SD = 0.42$), $F(2, 61) = 6.06$, $p < .005$.

Compensation

Effort Involved

Pharmacists (not novices) were asked to rate a list of pharmacy-related abilities as to how difficult or easy it would be for an aging pharmacist to overcome problems in each ability. The rating scale ranged from 1 (very easy to overcome) to 5 (very difficult to overcome). A single-factor (Age) MANOVA was performed on the pharmacists' ratings of the degree of difficulty or ease. There was no significant multivariate age difference. Nevertheless, because of expectations for

Table 16

Mean Ratings of the Developmental Direction Associated With the Clusters of Pharmacy-Related Abilities Produced by Younger, Middle-Aged, and Older Pharmacists

	Age Group		
Cluster	Younger	Middle-Aged	Older
Local Knowledge	1.45 (0.51)	1.60 (0.37)	1.89 (0.54)
Communication	2.21 (0.34)	2.07 (0.50)	2.10 (0.55)
Administration	2.42 (0.67)	2.24 (0.65)	2.36 (0.83)
Professional Responsibility	2.93 (0.47)	2.58 (0.57)	2.33 (0.71)
Cognitive	3.11 (0.52)	2.85 (0.49)	2.83 (0.47)
Speeded Performance	3.38 (0.60)	3.23 (0.76)	3.45 (0.60)
Updating	3.68 (0.41)	3.42 (0.42)	3.18 (0.49)

Note. Standard deviations in parentheses.

specific abilities, separate ANOVAs on each were conducted. However, in these individual ANOVAs, no significant age differences were observed. Table 17 displays the mean ratings of difficulty or ease for younger, middle-aged and older pharmacists.

An additional 3 X 7 (Age X Cluster) repeated measures MANOVA was performed on the average ratings of difficulty or ease associated with each cluster of pharmacy-related abilities. Average ratings of difficulty/ease were obtained in the same manner as outlined in the above section entitled "Developmental Direction of Beliefs." Results indicated a multivariate within-subjects effect which approached significance, Wilks' criterion $F(6, 46) = 2.17$, $p = .064$. The means and standard deviations associated with each cluster were calculated to be: Local knowledge ($\underline{M} = 2.79$, $\underline{SD} = 0.82$), communication ($\underline{M} = 2.98$, $\underline{SD} = 0.86$), administration ($\underline{M} = 2.94$, $\underline{SD} = 0.92$), professional responsibility ($\underline{M} = 2.98$, $\underline{SD} = 0.96$), cognitive ($\underline{M} = 3.09$, $\underline{SD} = 0.71$), speeded performance ($\underline{M} = 3.14$, $\underline{SD} = 0.82$), and updating ($\underline{M} = 3.07$, $\underline{SD} = 0.54$). A series of 21 paired samples t-tests were performed in order to identify those clusters of pharmacy-related abilities which differed significantly from one another on ratings of difficulty/ease. The results of these tests are displayed in Table 18. Significant differences were obtained for the comparisons between local knowledge ($\underline{M} = 2.79$) and cognitive ($\underline{M} = 3.09$), local knowledge ($\underline{M} = 2.79$) and speeded performance ($\underline{M} = 3.14$), and local knowledge ($\underline{M} = 2.79$) and updating ($\underline{M} = 3.07$). The interaction term was not significant.

<u>Pilot Study: Examining Ratings of Controllability</u>. The 30 pilot study participants were asked to rate the list of pharmacy-related abilities according to how controllable each ability was perceived to be. The controllability scale ranged from 1 (not at all) to 9 (very much). In order to establish whether age or gender differences were present, a 3 (Age) X 2 (Gender) MANOVA was performed on the participants' ratings of perceived controllability. None of the multivariate tests proved to be significant.

A 3 X 7 (Age X Cluster) repeated measures MANOVA was carried out on the mean ratings

Table 17

Mean Ratings of the Degree of Difficulty or Ease Associated with Overcoming Problems in a List of Pharmacy-Related Abilities

	Age Group		
Pharmacy-Related Abilities	Young	Middle-Aged	Old
Knowledge of regular customers	3 .05 (1.15)	2.69 (1.29)	3.05 (1.25)
Knowledge of how the business is run	2.70 (0.92)	3.00 (0.94)	3.23 (1.11)
Ability to operate new technologies	3.50 (0.83)	3.38 (0.80)	3.59 (0.73)
Awareness of new drugs on the market	3.00 (0.92)	2.84 (0.80)	2.70 (1.22)
Remembering item locations in pharmacy	2.90 (1.07)	2.92 (0.93)	2.59 (1.22)
Ability to give advice about over-the-counter drugs	2.85 (1.14)	2.84 (0.99)	2.86 (1.21)
Communicating effectively with customers	2.85 (0.88)	3.20 (1.15)	3.10 (1.26)
Knowledge of local physicians	2.15 (0.88)	2.54 (1.14)	2.86 (1.28)
Ability to read hand-written prescriptions	3.20 (0.83)	3.19 (1.27)	3.19 (1.17)
Speed at filling prescriptions	3.75 (0.85)	3.56 (1.04)	3.33 (1.24)
Communicating effectively with older adults	2.70 (1.26)	2.88 (1.37)	2.76 (1.30)
Errors in filling prescriptions	3.33 (0.86)	3.35 (1.02)	3.67 (0.91)
Absenteeism	3.65 (0.86)	3.38 (1.13)	3.00 (1.30)

cont.

Pharmacy-Related Abilities	Age Group		
	Young	Middle-Aged	Old
Ability to delegate to assistants or younger pharmacists	3.05 (0.85)	3.00 (1.19)	2.90 (1.07)
Punctuality	2.35 (1.04)	2.68 (1.22)	2.55 (0.94)
Reliability	2.95 (1.00)	3.15 (1.43)	3.00 (1.14)
Speed at locating items in the pharmacy	2.80 (0.95)	2.73 (1.00)	2.62 (1.20)
Knowledge of ethics and regulations	2.30 (1.03)	2.38 (0.80)	2.57 (1.21)
Empathy with customer	3.00 (1.26)	3.12 (1.21)	2.57 (1.21)
Ability to adapt to changes in the pharmacy or the profession	3.35 (0.88)	3.76 (0.66)	3.33 (0.80)
Ability to follow written directions and instructions	3.10 (1.21)	3.00 (1.04)	2.67 (0.97)
Patience	3.20 (0.89)	3.62 (1.24)	3.30 (1.17)
Ability to express instructions orally	2.95 (1.00)	2.92 (1.06)	2.71 (1.01)
Ability to train assistants and younger pharmacists	2.85 (0.67)	3.20 (1.12)	2.71 (1.19)

Note. Standard deviations in parentheses

Table 18

Paired-Samples t-tests Performed on the Ratings of Difficulty/Ease Associated with the Clusters of Pharmacy-Related Abilities

Clusters of Pharmacy-Related Abilities		t-value	df	p-value
Local Knowledge	Communication	1.55	63	.126
Local Knowledge	Administration	1.04	62	.303
Local Knowledge	Professional Responsibility	1.24	63	.221
Local Knowledge	Cognitive	2.78	65	.007
Local Knowledge	Speeded Performance	2.36	65	.021
Local Knowledge	Updating	3.05	62	.003
Communication	Administration	0.02	59	.982
Communication	Professional Responsibility	0.08	61	.94
Communication	Cognitive	1.31	62	.196
Communication	Speeded Performance	1.08	63	.283
Communication	Updating	1.47	59	.146
Administration	Professional Responsibility	0.17	59	.863
Administration	Cognitive	1.45	61	.153
Administration	Speeded Performance	1.22	61	.228
Administration	Updating	1.14	58	.258
Professional Responsibility	Cognitive	1.08	62	.287
Professional Responsibility	Speeded Performance	1.61	63	.113

cont.

Clusters of Pharmacy-Related Abilities		t-value	df	p-value
Professional Responsibility	Updating	1.04	60	.302
Cognitive	Speeded Performance	0.10	64	.918
Cognitive	Updating	0.05	61	.963
Speeded Performance	Updating	0.87	62	.387

of controllability associated with each cluster of pharmacy-related abilities. Table 19 presents the means produced for each cluster by younger, middle-aged, and older pharmacists. Results revealed a significant multivariate within-subjects effect, Wilks' criterion $F(6, 22) = 5.71$, $p < .005$. The means and standard deviations associated with each cluster of pharmacy-related abilities are as follows: Local knowledge (M = 7.06, SD = 1.17), communication (M = 7.02, SD = 1.44), administration (M = 6.92, SD = 1.46), professional responsibility (M = 7.23, SD = 1.40), cognitive (M = 6.58, SD = 1.38), speeded performance (M = 5.87, SD = 1.63), updating (M = 6.76, SD = 1.17). A series of 21 paired-samples t-tests were performed in order to identify those clusters which were significantly different from one another on ratings of controllability. The results of these tests are presented in Table 20. Significant differences were observed for the comparisons between local knowledge (M = 7.06) and speeded performance (M = 5.87), communication (M = 7.02) and cognitive (M = 6.58), communication (M = 7.02) and speeded performance (M = 5.87), administration (M = 6.92) and speeded performance (M = 5.87), professional responsibility (M = 7.23) and cognitive (M = 6.58), professional responsibility (M = 7.23) and speeded performance (M = 5.87), professional responsibility (M = 7.23) and updating (M = 6.76), cognitive (M = 6.58) and speeded performance (M = 5.87), and speeded performance (M = 5.87) and updating (M = 6.76).

Further analyses examined the relationship between the controllability of a list of pharmacy-related abilities, and the difficulty or ease associated with overcoming difficulties in the same list of abilities. It is important to note that ratings of controllability were indicated by pilot study participants, whereas ratings of difficulty or ease were indicated by pharmacists. Because of this fact, correlational analyses were not indicated. Instead, a series of steps were undertaken in order to examine the question within the framework of a repeated measures ANOVA. The first step involved determining whether certain levels of controllability existed in participants' ratings (e.g., high, medium or low ratings of controllability). One approach might have been to simply take the scale

Table 19

Mean Ratings of Controllability Associated With the Clusters of Pharmacy-Related Abilities Produced by Younger, Middle-Aged, and Older Pharmacists

	Age Group		
Cluster	Younger	Middle-Aged	Older
Local Knowledge	6.70 (1.53)	7.03 (0.91)	7.43 (0.99)
Communication	6.83 (1.92)	7.00 (1.21)	7.23 (1.21)
Administration	7.00 (1.45)	6.70 (1.86)	7.05 (1.09)
Professional Responsibility	7.13 (1.91)	7.40 (0.95)	7.17 (1.30)
Cognitive	6.33 (1.62)	6.55 (1.02)	6.88 (1.52)
Speeded Performance	5.60 (1.76)	5.80 (1.84)	6.20 (1.36)
Updating	7.05 (1.39)	6.65 (1.20)	6.58 (0.94)

Note. Standard deviations in parentheses.

Table 20

Paired-Samples t-tests Performed on the Mean Ratings of Controllability Associated with the Clusters of Pharmacy-Related Abilities

Clusters of Pharmacy-Related Abilities		t-value (29 df)	p-value
Local Knowledge	Communication	0.12	.902
Local Knowledge	Administration	0.49	.627
Local Knowledge	Professional Responsibility	0.65	.521
Local Knowledge	Cognitive	1.60	.121
Local Knowledge	Speeded Performance	3.84	.001
Local Knowledge	Updating	1.16	.254
Communication	Administration	0.44	.664
Communication	Professional Responsibility	1.22	.232
Communication	Cognitive	2.55	.016
Communication	Speeded Performance	4.83	<.001
Communication	Updating	0.98	.337
Administration	Professional Responsibility	1.24	.227
Administration	Cognitive	1.28	.212
Administration	Speeded Performance	3.23	.003
Administration	Updating	0.77	.450
Professional Responsibility	Cognitive	4.22	<.001
Professional Responsibility	Speeded Performance	5.12	<.001

cont.

Clusters of Pharmacy-Related Abilities		t-value (29 df)	p-value
Professional Responsibility	Updating	2.13	.042
Cognitive	Speeded Performance	2.73	.011
Cognitive	Updating	0.70	.490
Speeded Performance	Updating	2.84	.008

which participants used to make their ratings (which ranged from 1 to 9) and divide it into thirds (i.e., 1 to 3 = low controllability, 4 to 6 = medium controllability, 7 to 9 = high controllability). However, it was necessary to examine the distributional characteristics of the pilot study data in order to verify whether the average ratings of controllability (per pharmacy-related ability) actually fell within the categories of low, medium, and high. Table 21 displays the mean ratings of controllability per pharmacy-related ability for younger, middle-aged, and older participants. From this table, it is evident that none of the mean ratings of controllability fall within the "low controllability" level. Based on this, only two levels of controllability were defined: medium controllability (i.e., ratings ranging from 4.00 to 6.00), and high controllability (i.e., ratings of 7.00 to 9.00). It was then possible to determine which abilities fell into the medium controllability level, and which abilities fell into the high controllability level. In total, 7 of the 24 abilities fell into the high controllability level, whereas 14 fell into the medium controllability level.

The second step involved producing a dependent measure. A mean rating of the difficulty or ease associated with overcoming problems in each of the pharmacy-related abilities was needed. For each pharmacist, all of the ratings associated with the abilities falling in the high controllability category were added and divided by 7. Similarly, all of the ratings associated with the medium controllability abilities were added and divided by 14. A 3 X 2 (Age X Controllability) repeated measures ANOVA was performed on the mean ratings of difficulty or ease. The between-subjects factor was represented by the Age grouping, whereas the within-subjects factor was represented by the two levels of controllability. Results indicated a significant within-subjects effect, Wilks' criterion $F(1, 51) = 10.80$, $p<.005$. Overall mean ratings of difficulty or ease indicated that the high controllability abilities were perceived to be easier to overcome ($M = 2.82$, $SD = 0.62$), than were the medium-controllability abilities ($M = 3.05$, $SD = 0.56$). The three age groups did not differ significantly in their ratings (Medium controllability: M younger = 3.04, $SD = 0.06$; M middle-aged

Table 21

Mean Ratings of Controllability Per Pharmacy-Related Ability as Indicated by Younger, Middle-Aged, and Older Pilot Study Participants

	Age Group			Overall Rating
Pharmacy-Related Abilities	Young	Middle-Aged	Old	
Knowledge of regular customers	6.40 (2.46)	6.70 (2.16)	7.30 (1.25)	6.80 (1.99)
Knowledge of how the business is run	7.10 (1.86)	7.60 (1.17)	7.60 (1.08)	7.43 (1.38)
Ability to operate new technologies	7.30 (1.57)	6.00 (1.76)	5.50 (1.78)	6.27 (1.82)
Awareness of new drugs on the market	7.30 (1.57)	6.80 (1.23)	7.20 (1.55)	7.10 (1.42)
Remembering item locations in pharmacy	7.10 (1.79)	6.40 (1.71)	7.40 (1.35)	6.97 (1.63)
Ability to give advice about over-the-counter drugs	7.20 (1.48)	7.00 (1.25)	7.70 (1.42)	7.30 (1.37)
Communicating effectively with customers	7.00 (2.11)	7.10 (1.52)	7.40 (1.84)	7.17 (1.78)
Knowledge of local physicians	6.60 (2.32)	6.80 (1.23)	7.40 (1.43)	6.93 (1.70)
Ability to read hand-written prescriptions	5.00 (2.31)	5.90 (2.42)	6.90 (2.13)	5.93 (2.35)
Speed at filling prescriptions	6.10 (1.97)	5.10 (1.73)	5.90 (1.20)	5.37 (1.65)

cont.

Pharmacy-Related Abilities	Age Group: Young	Age Group: Middle-Aged	Age Group: Old	Overall Rating
Communicating effectively with older adults	6.70 (2.63)	6.30 (1.89)	7.70 (1.34)	6.90 (2.04)
Errors in filling prescriptions	6.90 (2.02)	6.60 (1.35)	6.20 (2.70)	6.57 (2.05)
Absenteeism	5.70 (1.71)	5.70 (1.83)	5.80 (1.40)	5.73 (1.60)
Ability to delegate to assistants or younger pharmacists	7.20 (1.55)	6.60 (2.32)	7.00 (1.41)	6.93 (1.76)
Punctuality	7.30 (2.11)	8.00 (1.25)	7.10 (1.45)	7.47 (1.63)
Reliability	7.20 (2.20)	7.60 (1.58)	8.20 (0.63)	7.67 (1.60)
Speed at locating items in the pharmacy	6.10 (1.97)	6.50 (2.17)	6.50 (1.65)	6.37 (1.88)
Knowledge of ethics and regulations	7.50 (1.96)	7.50 (1.43)	7.70 (0.95)	7.57 (1.45)
Empathy with customer	7.00 (2.00)	7.40 (1.96)	6.50 (1.58)	6.97 (1.83)
Ability to adapt to changes in the pharmacy or the profession	6.10 (1.52)	6.30 (2.06)	5.90 (1.45)	6.10 (1.65)
Ability to follow written directions and instructions	6.30 (1.95)	7.30 (1.70)	7.00 (1.70)	6.87 (1.78)
Patience	6.50 (2.46)	7.20 (1.81)	6.80 (1.62)	6.83 (1.95)
Ability to express instructions orally	6.60 (2.22)	7.00 (1.56)	7.30 (1.25)	6.97 (1.69)

cont.

Pharmacy-Related Abilities	Age Group Young	Middle-Aged	Old	Overall Rating
Ability to train assistants and younger pharmacists	6.80 (1.75)	6.80 (1.62)	7.10 (0.99)	6.90 (1.45)
Overall Ratings	6.67 (1.40)	6.76 (0.86)	6.96 (0.91)	6.80 (1.05)

Note. Standard deviations in parentheses

= 3.16, SD = 0.55; M older = 2.94, SD = 0.66; High controllability: M younger = 2.71, SD = 0.60; M middle-aged = 2.87, SD = 0.54; M older = 2.86, SD = 0.76).

Pilot Study: Sorting Task. Pilot study participants were also asked to sort 19 separate examples of compensatory behaviours into 5 smaller categories of compensation. Based on this, it was possible to compute the proportion of younger, middle-aged, and older participants that sorted each compensatory behaviour into each of the 5 categories. Table 22 displays this information. From this, it was possible to assign each compensatory behaviour into one of the five categories of compensation by choosing the category which was selected by the highest proportion of participants overall. Table 23 shows the percentage of agreement between participants from the three age groups in assigning each compensatory behaviour to a specific, validly identified compensatory category. The assignment of each compensatory behaviour to a compensatory category was considered prior to initiating the pilot study. Table 24 presents a comparison between the pre-pilot study efforts, and the actual pilot study results. Of the 19 opportunities for agreement, 11 cases were observed where pre-pilot study assignments and pilot study results were identical (57.9% agreement).

The Form of Compensation

Degree of Elaboration. As mentioned above, pharmacists were asked to rate a list of pharmacy-related abilities as to how difficult or easy it would be for an aging pharmacist to overcome aging-related problems with each ability. For each ability that was listed as being somewhat or very difficult to overcome, pharmacists were then asked how the aging pharmacist could overcome the problem. The responses of participants were scored to indicate the number of personal and knowledge elaborations produced. Macro-level analyses examined the total number of knowledge and personal elaborations produced, summed across all of the separate abilities. Micro-level analyses which examined the number of knowledge and personal elaborations produced per ability, were not possible due to statistical reasons. Specifically, in a multivariate analysis, there

Table 22

The Proportion of Younger, Middle-Aged, and Older Pilot Study Participants Who Sorted Each Compensatory Behaviour into Each of the 5 Categories of Compensation

Compensatory Behaviours	Categories				
	Ac.	As.	Se.	Su.	R.
	Y M O	Y M O	Y M O	Y M O	Y M O
Delegate difficult tasks to a younger person	.00 .10 .20 (10)	.10 .10 .00 (.07)	**.40 .60 .70 (.57)**	.50 .20 .10 (.27)	.00 .00 .00 (.00)
Avoid having to perform tasks that become difficult with age	.20 .20 .10 (.17)	.00 .10 .00 (.03)	**.80 .50 .50 (.60)**	.00 .20 .10 (.10)	.00 .00 .30 (.10)
Try harder when performing tasks that become difficult with age (make the effort)	.00 .00 .00 (.00)	.40 .10 .10 (.20)	.00 .00 .10 (.03)	.00 .10 .00 (.03)	**.60 .80 .80 (.73)**
Get more practice at difficult tasks (work at it)	.00 .00 .00 (.00)	.10 .10 .20 (.13)	.00 .00 .00 (.00)	.00 .10 .10 (.07)	**.90 .80 .70 (.80)**
Modify your expectations: your performance does not have to be perfect	**1.0 1.0 .60 (.87)**	.00 .00 .00 (.00)	.00 .00 .10 (.03)	.00 .00 .20 (.07)	.00 .00 .10 (.03)
Seek more training or updating of skills (courses, continuing education, studying, workshops, learning, instruction)	.00 .00 .00 (.00)	.40 .30 .10 (.27)	.00 .00 .20 (.07)	.00 .20 .00 (.07)	**.60 .50 .70 (.60)**

cont.

Compensatory Behaviours	Categories				
	Ac.	As.	Se.	Su.	R.
	Y M O	Y M O	Y M O	Y M O	Y M O
Budget more time to spend on the difficult tasks (take more time)	.20 .20 .20 (.20)	.50 .10 .20 (.27)	.00 .20 .40 (.20)	.00 .00 .00 (.00)	**.30 .50 .20 (.33)**
Find alternative tasks to concentrate on (rather than difficult ones)	.10 .00 .30 (.13)	.00 .00 .10 (.03)	**.80 .90 .60 (.77)**	.10 .10 .00 (.07)	.00 .00 .00 (.00)
Explain to others that you are having some difficulties because of your age	**1.0 .90 .50 (.80)**	.00 .10 .20 (.10)	.00 .00 .00 (.00)	.00 .00 .30 (.10)	.00 .00 .00 (.00)
Do more administration or organizational activities	.00 .20 .20 (.13)	.10 .20 .10 (.13)	**.70 .60 .60 (.63)**	.20 .00 .10 (.10)	.00 .00 .00 (.00)
No way of overcoming, retire	**.70 .70 .80 (.73)**	.00 .10 .20 (.10)	.30 .20 .00 (.17)	.00 .00 .00 (.00)	.00 .00 .00 (.00)
Recognition of problem, become aware of problem	.40 .25 .30 (.32)	**.30 .50 .20 (.33)**	.10 .25 .10 (.15)	.10 .00 .10 (.07)	.10 .00 .30 (.13)
Consult with someone else (co-worker, other pharmacist, doctor)	.10 .20 .20 (.17)	**.70 .40 .30 (.47)**	.10 .10 .10 (.10)	.00 .20 .30 (.17)	.10 .10 .10 (.10)
Counselling	.10 .20 .30 (.20)	**.50 .50 .30 (.43)**	.00 .10 .20 (.10)	.00 .00 .20 (.07)	.40 .20 .00 (.20)

cont.

Compensatory Behaviours	Categories				
	Ac.	As.	Se.	Su.	R.
	Y M O	Y M O	Y M O	Y M O	Y M O
Experience, more experience (as opposed to practice)	.00 .00 .00 (.00)	**.50 .60 .40** **(.50)**	.00 .10 .10 (.07)	.30 .10 .20 (.20)	.20 .20 .30 (.23)
Rely on others	**.20 .20 .50** **(.30)**	.30 .00 .30 (.20)	.20 .40 .20 (.27)	.30 .40 .00 (.23)	.00 .00 .00 (.00)
Look for another job, changing jobs, leave the job	**.50 .50 .50** **(.50)**	.10 .10 .00 (.07)	.40 .20 .20 (.27)	.00 .20 .30 (.17)	.00 .00 .00 (.00)
Improve health, get help (specific to health)	.00 .00 .00 (.00)	**.30 .40 .60** **(.43)**	.00 .20 .10 (.10)	.10 .10 .10 (.10)	.60 .30 .20 (.37)
Organize, organization	.00 .10 .20 (.10)	**.80 .30 .20** **(.43)**	.10 .20 .40 (.23)	.10 .20 .20 (.17)	.00 .20 .00 (.07)

Note. Ac. = Accommodation, As. = Assimilation, Se. = Selection, Su. = Substitution, R. = Remediation

Table 23

The Percentage of Agreement Between Younger, Middle-Aged, and Older Pilot Study Participants in Choosing the Most Representative Category of Compensation

Compensatory Behaviours	Category	Age Group			Overall
		Younger	Middle-Aged	Older	
Delegate difficult tasks to a younger person	Se.	40.0	60.0	70.0	56.7
Avoid having to perform tasks that become difficult with age	Se.	80.0	50.0	50.0	60.0
Try harder when performing difficult tasks that become difficult with age (make the effort)	R.	60.0	80.0	80.0	73.3
Get more practice at difficult tasks (work at it)	R.	90.0	80.0	70.0	80.0
Modify your expectations: your performance does not have to be perfect	Ac.	100.0	100.0	60.0	86.7
Seek more training or updating of skills (courses, continuing education, studying, work-shops, learning, instruction)	R.	60.0	50.0	70.0	60.0
Budget more time to spend on the difficult tasks (take more time)	R.	30.0	50.0	20.0	33.3
Find alternative tasks to concentrate on (rather than the difficult ones)	Se.	80.0	90.0	60.0	76.7

cont.

Compensatory Behaviours	Category	Age Group			Overall
		Younger	Middle-Aged	Older	
Explain to others that you are having some difficulties because of your age	Ac.	100.0	90.0	50.0	80.0
Do more administration or organizational activities	Se.	70.0	60.0	60.0	63.3
No way of overcoming, retire	Ac.	70.0	70.0	80.0	73.3
Recognition of problem, become aware of problem	As.	30.0	50.0	20.0	33.0
Consult with someone else (co-worker, other pharmacist, doctor)	As.	70.0	40.0	30.0	46.7
Counselling	As.	50.0	50.0	30.0	43.3
Experience, more experience (as opposed to practice)	As.	50.0	60.0	40.0	50.0
Rely on others	Ac.	20.0	20.0	50.0	30.0
Look for another job, changing jobs, leave the job	Ac.	50.0	50.0	50.0	50.0
Improve health, get help (specific to health)	As.	30.0	40.0	60.0	43.3
Organize, organization	As.	80.0	30.0	20.0	43.3

Note. Ac. = Accommodation, As. = Assimilation, Se. = Selection, Su. = Substitution, R. = Remediation.

Table 24

A Comparison Between the Pre-Pilot Study Assignment of Compensatory Behaviours to Compensatory Categories with the Pilot Study Results

Compensatory Behaviours	Pre-Pilot Study Assignment	Pilot Study Results
Delegate difficult tasks to a younger person	Accommodation	Selection
Avoid having to perform tasks that become difficult with age	Accommodation	Selection
Try harder when performing difficult tasks that become difficult with age (make the effort)	Remediation	Remediation
Get more practice at difficult tasks (work at it)	Remediation	Remediation
Modify your expectations: your performance does not have to be perfect	Accommodation	Accommodation
Seek more training or updating of skills (courses, continuing education, studying, workshops, learning, instruction)	Assimilation	Remediation
Budget more time to spend on the difficult tasks (take more time)	Remediation	Remediation
Find alternative tasks to concentrate on (rather than the difficult ones)	Selection	Selection
Explain to others that you are having some difficulties because of your age	Accommodation	Accommodation
Do more administration or organizational activities	Assimilation	Selection

cont.

Compensatory Behaviours	Pre-Pilot Study Assignment	Pilot Study Results
No way of overcoming, retire	Accommodation	Accommodation
Recognition of problem, become aware of problem	Accommodation	Assimilation
Consult with someone else (co-worker, other pharmacist, doctor)	Assimilation	Assimilation
Counselling	Assimilation	Assimilation
Experience, more experience (as opposed to practice)	Assimilation	Assimilation
Rely on others	Accommodation	Assimilation
Look for another job, changing jobs, leave the job	Selection	Accommodation
Improve health, get help (specific to health)	Assimilation	Assimilation
Organize, organization	Substitution	Assimilation

were too few participant responses per ability to carry out a MANOVA.

Macro-Level Results. A single-factor (Age) ANOVA was performed on the total number of knowledge elaborations produced by pharmacists, when discussing their beliefs about what could be done to overcome difficulties with all the abilities combined. No significant age differences were observed. A single-factor (Age) ANOVA was also performed on the total number of personal elaborations produced when discussing these same beliefs. Again, no significant age differences were found. Also, the total number of elaborations (knowledge and personal combined) were entered into a single-factor (Age) ANOVA. No significant age differences were revealed. Table 25 displays the mean number of elaborations produced by pharmacists of all ages.

The Chosen Forms of Compensation. For each pharmacist, the total number of times each compensatory category was selected was calculated. In order to test whether age differences existed with respect to the number of times pharmacists selected each of the five forms of compensation, a single-factor (Age) MANOVA was performed on the total number of times each compensatory category was selected. Results failed to reveal significant differences. Table 26 lists the means for each age group.

A 3 X 4 (Age X Compensation Form) repeated measures MANOVA was also carried out on the total number of times each compensatory category was selected. The between-subjects factor was represented by the Age variable, whereas the within-subjects factor was represented by the chosen form of compensation. (Note that of the 5 categories of compensation, the category of substitution was not used by pilot study participants, thus reducing the within-subjects factor to 4 levels.) The results yielded a significant multivariate within-subjects effect, Wilks' criterion $F(3, 66) = 26.30$, $p > .001$. The following means and standard deviations were observed for each category of compensation: Accommodation ($M = 1.45$, $SD = 2.39$), assimilation ($M = 0.79$, $SD = 1.16$), selection ($M = 0.25$, $SD = 0.80$), and remediation ($M = 2.58$, $SD = 2.31$). In order to determine

Table 25

Mean Number of Total Elaborations Produced (Both Knowledge and Personal) By Different Pharmacist Age Groups When Discussing Beliefs About Strategies for Overcoming Difficulties in a List of Pharmacy-Related Abilities

	Age Group		
	Younger	Middle-Aged	Older
	14.10 (8.34)	13.61 (10.29)	12.43 (10.33)

Note. Standard deviations in parentheses.

Table 26

The Mean Number of Times Pharmacists Selected Each Category of Compensation

Categories	Age Groups		
	Younger	Middle-Aged	Older
Accommodation	0.90 (1.21)	2.00 (2.64)	1.85 (3.08)
Assimilation	0.85 (1.14)	0.84 (1.25)	0.95 (1.23)
Selection	0.20 (0.41)	0.48 (1.26)	0.10 (0.31)
Substitution	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Remediation	2.65 (2.39)	2.76 (2.31)	3.20 (2.14)

Note. Standard deviations in parentheses.

which categories of compensation were chosen significantly more often than others, a series of paired-sample t-tests were performed. The results of these tests are presented in Table 27. Significant differences were obtained for the comparisons between accommodation ($\underline{M}$ = 1.45) and assimilation ($\underline{M}$ = 0.79), accommodation ($\underline{M}$ = 1.45) and selection ($\underline{M}$ = 0.25), accommodation ($\underline{M}$ = 1.45) and remediation ($\underline{M}$ = 2.58), assimilation ($\underline{M}$ = 0.79) and selection ($\underline{M}$ = 0.25), assimilation ($\underline{M}$ = 0.79) and remediation ($\underline{M}$ = 2.58), and selection ($\underline{M}$ = 0.25) and remediation ($\underline{M}$ = 2.58).

The Perceived Effectiveness of Compensatory Strategies

A 3 X 2 (Age X Expertise) MANOVA was performed on participants' ratings of the perceived effectiveness of a list of compensatory strategies. A significant multivariate main effect of Expertise was observed, Wilks' criterion $\underline{F}(10, 113) = 4.79$, $\underline{p} < .001$. Table 28 reveals the results obtained for the univariate tests.

Overall Improvement versus Decline

All participants were asked to comment on what work-related abilities change as the aging pharmacist gets older. The number of improvement-oriented beliefs was added to the number of decline-oriented beliefs. This total was used to calculate the proportion of improvement-oriented and decline-oriented beliefs of each participant across age groups and expertise. A paired-samples t-test revealed that the proportion of decline-oriented beliefs (0.86), ($\underline{M}$ = 1.97, $\underline{SD}$ = 1.25) were more prevalent than the proportion of improvement-oriented beliefs (0.14), ($\underline{M}$ = 0.32, $\underline{SD}$ = 0.61), $\underline{t}(122) = 13.94$, $\underline{p} < .01$.

As mentioned previously, pharmacists (not novices) were also asked two follow-up questions (i.e., they were asked to indicate which work-related abilities were expected to decline versus improve). An analysis identical to the one described above was carried out. There was no difference between the proportion of decline-oriented beliefs (0.50), ($\underline{M}$ = 2.02, $\underline{SD}$ = 1.33) and the proportion of improvement-oriented beliefs (0.50), ($\underline{M}$ = 1.75, $\underline{SD}$ = 0.85).

Table 27

Paired-Samples t-tests Performed on the Frequency of Selection of Each of the Categories of Compensation

Forms of Compensation		t-value	df	p-value
Accommodation	Assimilation	2.42	70	.018
Accommodation	Selection	4.18	70	<.001
Accommodation	Remediation	3.22	70	.002
Assimilation	Selection	4.33	71	<.001
Assimilation	Remediation	6.75	71	<.001
Selection	Remediation	8.01	71	<.001

Table 28

The Mean Ratings of the Perceived Effectiveness of a List of Compensatory Strategies Indicated by Pharmacists and Novices

		Pharmacists	Novices	$\underline{F}(1, 122)$	p-value
Try harder when performing tasks that become difficult with age	a	3.76 (0.99)	2.81 (1.32)	22.28	<.001
Get more practice at difficult tasks	a	4.13 (0.90)	2.84 (1.31)	37.11	<.001
Seek more training or updating of skills	a	4.53 (0.76)	3.83 (1.28)	13.37	<.001
Budget more time to spend on the difficult tasks	a	4.21 (0.94)	3.73 (1.21)	4.26	.041
Modify your expectations: your performance does not have to be perfect	a	2.79 (1.39)	2.41 (1.58)	1.43	.234
Delegate difficult tasks to a younger person	b	3.49 (1.26)	3.92 (1.22)	3.97	.049
Avoid having to perform tasks that become difficult with age	b	2.75 (1.25)	3.30 (1.42)	5.64	.019
Find alternative tasks to concentrate on (rather than the difficult ones)	b	2.25 (1.27)	3.00 (1.31)	9.57	.002
Explain to others that you are having some difficulties because of your age.	b	2.51 (1.23)	2.71 (1.49)	0.04	.847

cont.

	Pharmacists	Novices	$\underline{F}(1, 122)$	$\underline{p}$-value
Do more organizational activities	[b] 3.22 (1.30)	3.73 (1.25)	4.81	.030

Note. Standard deviations are in parentheses.

[a] Pharmacists > Novices

[b] Novices > Pharmacists

CHAPTER V

DISCUSSION

Participants' Implicit Theories of Aging

Beliefs About Work-Related Abilities Expected to Change

Participants' responses were examined in order to provide an overall picture of the beliefs that were mentioned. The beliefs of pharmacists will be discussed first, followed by the beliefs of novices. A discussion of the similarities and differences between the two groups will follow.

Pharmacists. As indicated in Table 1, the most prominent decline-oriented categories mentioned were "other cognitive decline", "mobility decline," and "visual decline." These findings would suggest that pharmacists are most concerned with limited decline occurring in three broad areas (i.e., cognitive, motor, and sensory decline). Such beliefs are not surprising, as age-related declines have been established in the aging literature, within each of these three broad areas. Overall, pharmacists' most prevalent beliefs about declining abilities would appear to be reflective of the declines which naturally occur with aging. In contrast, the least frequently mentioned areas of decline reported by pharmacists were: less managerial expertise, less customer expertise, less pharmacist expertise, and less patience. This would seem to suggest that pharmacists were least concerned about declines in their work-related expertise. It may be that pharmacists recognize that these work-related abilities tap their accumulated knowledge and experience, and therefore may be least likely to show decline. Following from this, if pharmacists believe that these expertise-based abilities are not likely to show decline over time, they may also believe that such abilities are likely to be maintained, or even improved upon over time. Evidence of this was found when examining pharmacists' statements which were improvement-oriented. Specifically, it was observed that the categories of "more expertise related to the pharmacist role," and "more customer expertise" were mentioned most frequently. These findings would suggest that pharmacists believe that abilities which access their work-related expertise are not likely to decline, but instead, are likely to show some improvements over time. Again, the aging literature has established that, in most cases, abilities related to one's area of expertise are likely to be maintained, or even improved, as one ages.

Novices. The most frequently mentioned decline-oriented beliefs dealt with visual, memory, and mobility declines. As mentioned above, these represent common beliefs about aging in general, and evidence exists to support the idea that some age-related decline naturally occurs in each of these areas. In contrast, where improvement-oriented beliefs were concerned, novices were most likely to mention beliefs which fell into the "other" category most frequently.

Similarities Between Pharmacists and Novices. It would appear that pharmacists and novices share the belief that declines will occur in sensory abilities (most notably the visual domain), cognitive abilities (including memory), and physical domains (most notably in reference to mobility). This similarity may be due to the fact that social stereotypes and cultural norms play a role in shaping beliefs about the decline-oriented nature of aging. Pharmacists and novices would be equally subject to such influences. Both groups would also be likely to recognize that certain types of age-related decline are normal as one ages.

Differences Between Pharmacists and Novices. Pharmacists were less likely than novices to mention beliefs about the aging pharmacists' declining professional- and customer-related expertise. Further, pharmacists were more likely than novices to mention the belief that professional and customer expertise would increase over time. This may be indicative of a professional bias (i.e., efforts to portray professional colleagues in the best light, resulting in an unwillingness to suggest that knowledge and experience-based abilities may eventually decline). On the other hand, this trend may also reflect a more accurate awareness of actual maintenance (or possibly increase) of such abilities over time.

Another key difference between pharmacists and novices is the frequency with which "other cognitive decline" was mentioned. This was one of the most frequently mentioned areas of decline referred to on behalf of pharmacists, whereas for novices it was one of the least mentioned areas. This difference may be due to the fact that pharmacists have a greater familiarity with the types of tasks involved in running a pharmacy, and therefore the cognitive demands which are commonplace to this work-related setting. This greater familiarity may lead pharmacists to comment more frequently on possible declines associated with cognitive tasks.

Other Characteristics of Participants' Responses

Analyses also indicated that decline-oriented beliefs were significantly more prevalent than improvement-oriented beliefs, regardless of age or expertise. It should be noted, however, that participants did not include a great number of beliefs in their responses. In fact, the mean number of decline-oriented beliefs mentioned by participants was 1.68, while the mean number of improvement-oriented beliefs was 0.29. These means may seem low. However, this research differs from other studies in the area (e.g., Heckhausen, 1992), in two respects. First, the present study places a specific emphasis on how an *expert* ages, as opposed to focussing on an aging individual in the general case. Participants may have had some difficulty in expressing their beliefs about aging, while incorporating the element of expertise. Perhaps the same participants involved in this study may have produced a greater mean number of beliefs if there was no mention made of the element of expertise. For example, participants may have found it easier to answer a question such as, "Can you think of any abilities that change as one gets older?," where the reference to an area of expertise has been removed.

Second, the present study differs from other research which studies beliefs about aging as it involves asking for participants' beliefs, and then scoring the content of participants' responses. Previous research has taken a different approach. For example, participants in other studies have been asked to rate a list of attributes in terms of how they are believed to age over time (e.g., Heckhausen, 1992). In contrast, participants in the present study are asked to generate their own beliefs, which naturally requires more effort. This fact, coupled with the element of expertise which was embedded within the question, may have contributed to the observed low means.

Follow-Up Probes

Pharmacists (not novices) were later asked two follow-up questions which probed for beliefs either specifically related to decline or improvement in the aging pharmacist's abilities.

Decline. Pharmacists again mentioned the areas of "mobility decline, other cognitive decline and visual decline" most frequently. As well, pharmacists were least likely to refer to declines in customer and managerial expertise. It is interesting to note that mention of declines in pharmacist expertise became slightly more prevalent in response to this follow-up question. Perhaps the inclusion of a probe specifically designed to elicit beliefs about decline facilitates the acknowledgement of less desirable changes with age. In other words, it may be understandably somewhat difficult for pharmacists to acknowledge declines in their area of expertise when asked to comment on how work-related abilities *change* over time. It is arguable that one's professional identity is a salient feature of one's life. However, when further probed for specific beliefs about *declining* work-related abilities, such declines in one's professional expertise may be mentioned slightly more often.

Improvement. When pharmacists were asked specifically to comment on the work-related abilities that were believed to improve, it was observed that customer and pharmacy-related expertise were again most often cited, whereas patience and managerial expertise were least often mentioned.

Central Themes

Overall, three central themes become apparent when examining the patterns associated with the participants' beliefs. First, when simply asked to comment on what work-related abilities might change for the aging pharmacist, it was observed that decline-oriented beliefs were more prevalent than improvement-oriented beliefs for all participants, regardless of age or expertise. This outcome was predicted, as similar findings have been established in other literature which examines beliefs about aging (e.g., Heckhausen et al., 1989), as well as the life-span development and aging literature which states that the gains:loss ratio decreases over the lifespan (Baltes, 1987). Second, beliefs about declining abilities tended to be associated with physical, cognitive, and sensory problems, whereas beliefs about improvements were mostly associated with knowledge and experiential factors (i.e., work-related expertise). Again, this was the case for all participants, regardless of age or expertise. This finding was predicted based on past research which has documented age-related decline in physical, cognitive and sensory domains, as well as research which indicates that age-related improvements are possible in areas related to one's expertise. Third, it was apparent that membership in a professional group may be related to a reduced likelihood of reporting age-related declines in abilities related to work-related expertise, and a greater likelihood of acknowledging improvements in such abilities, in comparison to novices.

The Degree of Differentiation Present in Participants' Beliefs

Beliefs About Changes in the Aging Pharmacists' Abilities

Originally, an Age X Expertise interaction was hypothesized with respect to the various measures of the degree of differentiation present in participants' responses. Specifically, middle-aged and older pharmacists were expected to indicate beliefs which were the most differentiated, whereas younger novices would indicate the least differentiated beliefs.

Macro-Level Findings. This hypothesis was not borne out at the macro-level for any of the dependent measures used. Instead, the professional status of participants (i.e., expert versus novice) was more likely to be a factor in defining significant differences. Specifically, pharmacists used a greater number of elaborations and words than novices, when describing their beliefs. It seems reasonable to argue that this is likely due to the pharmacists' greater familiarity with the domain of pharmacy. It should be acknowledged, however, that although these differences were statistically significant, it becomes less meaningful when one considers that although pharmacists spoke at greater lengths, they produced roughly equivalent numbers of total elaborations as compared to novices (i.e., approximately 3 per overall response).

Further, analyses indicated that of the total number of elaborations produced, a greater number were decline-oriented as opposed to improvement-oriented. Again, this seems to be in line with most research on aging which involves some examination of the prevalence of decline- versus improvement-oriented beliefs.

Only one other significant difference was observed at the macro-level. Pharmacists produced more decline-oriented personal elaborations than did novices. On the surface, it seems understandable that pharmacists would be more likely to comment on personal experiences with declining pharmacy-related abilities, as they have had first-hand experience in carrying out these tasks. A more in-depth discussion of this finding suggests that while this difference was found to be statistically significant, it is not suggestive of a substantive finding, as the mean numbers of personal elaborations were less than one.

Overall, when taking all of the macro-level analyses into account, it is arguable that participants responded in a relatively similar fashion from a meaningful viewpoint. Specifically, participants' responses tended to include roughly the same number of elaborations, which were largely decline-oriented.

Micro-Level Findings. When examining the specific beliefs of participants, results indicated that all of the significant differences observed involved contrasts between pharmacists and novices. With respect to personal elaborations, it was noted that pharmacists generated a greater number in reference to beliefs about mobility decline than novices. As pharmacists are more familiar with "getting around" in the pharmacy (e.g., locating items in the pharmacy, physically preparing medications) than novices, they would likely be more aware personal experiences with difficulties in mobility.

As well, where knowledge elaborations were concerned, pharmacists produced a greater number than novices for the categories of "other cognitive decline," whereas novices produced more for the categories of "visual decline, memory decline and less pharmacist expertise." The fact that pharmacists have focussed on other forms of cognitive decline indicates that there may be less obvious forms of cognitive decline which are recognized by pharmacists. Again, as a result of pharmacists' greater familiarity with their work-related duties, it is reasonable to expect that they will have a greater awareness than novices of the more subtle declines occurring in cognitive tasks. The fact that pharmacists produced fewer knowledge elaborations than novices for the remaining categories suggests that they believe that declines in vision, memory, and pharmacy-related expertise are not as important as cognitive decline. This may be due to the fact that pharmacists are aware of compensatory strategies that are effective in dealing with visual decline (e.g., prescription glasses, visual aids), and memory decline (e.g., physical and electronic reminders). The finding that pharmacists produced fewer knowledge elaborations when discussing declines in work-related expertise is not surprising, as pharmacists were more likely than novices to comment on improvements in their work-related expertise.

Beliefs About Decline in the Aging Pharmacist's Abilities

Originally it was hypothesized that middle-aged and older pharmacists would indicate beliefs which were more differentiated than their younger professional peers.

Macro- and Micro-Level Findings. Of all the analyses conducted at these two levels, support was not found for this hypothesis. However, analyses did indicate significant age differences in two areas. First, it was observed that older pharmacists produced more decline-oriented knowledge elaborations ($M = 2.85$) than middle-aged pharmacists ($M = 1.68$). Younger pharmacists

($\underline{M}$ = 1.89) occupied an intermediary position and did not differ significantly from either middle-aged or older pharmacists. Second, it was observed that older pharmacists produced more decline-oriented elaborations overall (both knowledge and personal elaborations combined) ($\underline{M}$ = 2.92) than middle-aged pharmacists ($\underline{M}$ = 1.76). Again, younger pharmacists ($\underline{M}$ = 1.95) fell in between middle-aged and older pharmacists with respect to the overall number of decline-oriented elaborations produced. In both cases mentioned above, younger and older pharmacists expressed a greater number of decline-oriented elaborations than middle-aged pharmacists. An interpretation of this trend may involve the fact that different life experiences are involved within each segment of the life-span (i.e., younger, middle-aged, and older segments). Specifically, younger pharmacists, who have not yet begun to experience appreciable age-related declines, may be quite willing to consider such changes. Similarly, older pharmacists, who have most likely experienced certain age-related declines in their duties as a pharmacist, have come to accept the fact that such declines are a normal correlate of aging. However, middle-aged pharmacists may find themselves at a point where declines in their work-related abilities are only just beginning to become a reality. The lower number of decline-oriented knowledge elaborations, and overall elaborations, may be indicative of an unwillingness to consider age-related declines.

Beliefs About Improvements in the Aging Pharmacist's Abilities

Originally it was hypothesized that middle-aged and older pharmacists would indicate beliefs which were more differentiated than their younger professional peers. Further, it was also hypothesized that middle-aged and older pharmacists would indicate a greater number of improvement-oriented elaborations, compared to younger pharmacists.

Macro- and Micro-Level Findings. These hypotheses received no support in any of the analyses conducted at these two levels of investigation. Further, no age differences were observed at either the macro- or micro-level. The findings seem to indicate that the beliefs of pharmacists from each age group were similarly differentiated, when considering age-related improvements in their work-related abilities. As well, the findings indicated that pharmacists from each age group had roughly the same number of optimistic things to say when commenting on the aging of their work-related abilities. These findings might suggest that the developmental status of pharmacists (i.e., whether they are younger, middle-aged, or older) does not play a role in influencing the quality or quantity of their beliefs about improvements in work-related abilities. This may be due to the fact that age-related improvements may be witnessed among aging professional peers by pharmacists of all ages.

Follow-Up Probes

Additional analyses which examined the two follow-up questions overall, indicated two non-significant, yet notable trends. First, older pharmacists produced a greater number of total elaborations as compared to younger and middle-aged pharmacists. Second, a more detailed investigation of the elaborations indicated that older pharmacists produced a substantially greater number of decline-oriented elaborations than they did improvement-oriented elaborations, whereas younger and middle-aged pharmacists produced equal numbers of elaborations for improvement- and decline-oriented beliefs. These findings indicate that older pharmacists, in general, do not have the balanced beliefs (i.e., roughly equal decline and improvement-oriented beliefs) of their middle-aged and younger professional peers. First-hand experience of the declines which occur in later adulthood is likely to be a key explanatory factor. Older pharmacists, who have arguably had the most experience with age-related declines, may be likely to produce a greater number of decline-oriented elaborations than improvement-oriented ones, when compared to their middle-aged and younger professional peers.

Developmental Direction of Beliefs

Results Pertaining to Specific Pharmacy-Related Abilities

Age effects were predicted with respect to the ratings of the developmental direction associated with a list of pharmacy-related duties. Middle-aged and older pharmacists were expected to produce significantly more optimistic views (as indicated by ratings closer to the value of #1) when compared to younger pharmacists. Direct and limited support for this hypothesis was found in four of the six cases where significant age differences were present. Direct support was observed when considering the ratings of the developmental direction associated with absenteeism. The more optimistic view associated with the older age groups may reflect first-hand experience in being reliable members of the professional health community, despite having likely experienced normal age-related declines. In contrast, younger pharmacists, who have not had to cope with age-related declines, may be more inclined to believe that such declines will inevitably lead to missed days at work.

Limited support for the above hypothesis was found in three instances. In particular, older pharmacists indicated more favourable ratings than younger pharmacists for (a) knowledge of ethics and regulations, (b) the ability to adapt to changes in the pharmacy or the profession, and (c) the ability to follow written directions and instructions. It is noteworthy that two of these abilities (i.e., knowledge of ethics and regulations, and the ability to follow written directions and instructions) relate to the accumulated procedural and factual knowledge acquired by aging pharmacists. It is possible that older pharmacists have acknowledged that certain abilities which tap their knowledge- and experienced-based expertise may be maintained, or even improved upon over time. The finding that the older pharmacists were more optimistic about the ability to adapt to work-related changes may be the result of first-hand experience in successfully meeting the changing demands of their profession. It may also reflect the healthiest attitude towards meeting changing industry-related demands, while being confronted with realistic age-related decline.

It should also be noted that contradictory evidence for the above hypothesis was obtained with respect to the ratings associated with two of the pharmacy-related abilities. When considering the ability "knowledge of regular customers," middle-aged pharmacists indicated less optimistic ratings than younger pharmacists. As well, older pharmacists produced less optimistic ratings for the ability "knowledge of how the business is run," when compared to younger pharmacists. These differences may be related to the ever-changing nature of the pharmacy industry. For purposes of discussion, such changes may hypothetically include (a) increasing customer volumes, (b) a decrease in the number of customers who regularly patronize one particular pharmacy, and (c) the steady introduction of computers into the workplace. Where knowledge of regular customers is concerned, it may be that middle-aged pharmacists no longer believe that it is possible to "keep up with the names and faces" in the day-to-day operations of a running a pharmacy, if their client base is continually changing. Further, where business knowledge is concerned, older pharmacists may be less inclined to indicate that they will be knowledgable of how to run a pharmacy as computerization and other technological advances continue to make past operating procedures somewhat obsolete.

It should be noted that when reviewing the findings pertaining to the older pharmacists, two seemingly contradictory beliefs emerged. On the one hand, older pharmacists expressed more optimism than younger pharmacists about the developmental direction associated with managing the changes occurring within the pharmacy industry. However, older pharmacists indicated less optimistic beliefs than their younger peers when considering the developmental course associated with knowledge of regular customers. This may indicate that older pharmacists have adopted a general sense of optimism with regards to their ability to manage industry-related changes, while recognizing that some abilities (e.g., knowledge of regular customers) are likely to show signs of decline.

Results Pertaining to Clusters of Pharmacy-Related Abilities

Again, limited support was found for the hypothesis outlined in the previous section. In one case, older pharmacists believed that the Professional Responsibilities cluster would show significantly higher degrees of age-related improvement than younger pharmacists. In another case, older pharmacists held significantly more favourable developmental beliefs than younger pharmacists when considering the Updating cluster of pharmacy-related abilities. These findings may indicate that older pharmacists believe that it is possible for their typical same-aged peers to maintain their grasp of current pharmacy-related knowledge and skills, and even improve upon their overall reliability as members of the professional community.

Some contradictory evidence for the above hypothesis was obtained. Older pharmacists expressed more pessimistic developmental beliefs compared to younger pharmacists, when considering the developmental direction associated with the aging pharmacist's local knowledge. As mentioned in the section above, this may indicate that older pharmacists believe that keeping abreast of all of the minute changes in their work-related environments (e.g., changing clientele) may be unrealistic.

Compensation

Effort Involved

It was originally predicted that middle-aged and older pharmacists would indicate that problem areas were easier to overcome than younger pharmacists. This hypothesis was not supported when performing analyses at the level of the individual pharmacy-related abilities. The absence of age effects would seem to suggest that pharmacists belonging to each age group hold similar beliefs about the degree of difficulty involved in overcoming problems with a list of pharmacy-related abilities. The grand mean ($\underline{M} = 2.95$) obtained for the ratings indicated that pharmacists, on average, believed that an average amount of effort would be required to overcome most difficulties with work-related tasks.

Other analyses provided clues as to the participants' beliefs about the degree of difficulty involved with overcoming problems with the various clusters of pharmacy-related abilities. In particular, it seems that problems with an aging pharmacist's local knowledge (i.e., knowledge of regular customers, business operation, and local physicians) are believed to be easier to overcome than difficulties involving cognitive tasks, speeded tasks, and updating skills. It is important to note, however, that the mean ratings of difficulty/ease are all approximately equal (with rounding the means equal to 3 on the rating scale). This would indicate that pharmacists from each age group believe that difficulties with the above clusters of pharmacy-related abilities would present an average amount of difficulty where compensatory efforts are concerned.

Pilot Study Results

A purpose of the pilot study was to arrive at a valid estimate of the ratings of controllability for a list of pharmacy-related abilities (1 = not at all, 9 = very much). These ratings were to be used in other analyses discussed below. Results suggested that pilot study participants did not differ in their ratings of controllability based on age. The overall grand mean (M = 6.80) suggested that pilot study participants believed that the list of pharmacy-related abilities were of greater than average controllability.

Other analyses indicated that pilot study participants believed that certain clusters of pharmacy-related abilities were more or less controllable than others. The most notable finding is that tasks involving speeded performance were rated as being significantly less controllable than all of the remaining clusters of abilities. This finding makes sense when one considers the fact that the cognitive aging literature reports that age-related decline in speeded tasks is a normal and unavoidable fact of aging. From this standpoint, it may be argued that the beliefs of pilot study participants were veridical with respect to their ratings of perceived controllability. It is also noteworthy that the remaining clusters of abilities, which were predominantly associated with one's accumulated knowledge and experience (e.g., local knowledge, administration), were rated as being more controllable. As previous research has indicated that maintenance and even improvements are possible in tasks which access "crystallized intelligence" (Cattell, 1971; Horn, 1982), the beliefs of pilot study participants may again be characterized as veridical, with respect to their ratings of perceived controllability.

It was originally hypothesized that problems areas which may be perceived as being more controllable should be considered easier to overcome. Support for this hypothesis was found. Problems with "high controllability" abilities were believed to be easier to overcome than difficulties with abilities that are perceived to be less controllable. While this finding makes intuitive sense, it nevertheless has important ramifications. Namely, it provides insight as to where compensatory efforts are likely to be directed. If it is generally believed that one cannot do very much about influencing the decline in speeded tasks, then one is not likely to exert much effort in addressing this type of decline. From this, it is reasonable to assume that compensatory efforts would likely involve more "passive" forms. In other words, rather than engage in direct efforts to attempt to counter the decline in speeded tasks, aging pharmacists may be more likely to (a) change their goals or expectations for success when performing speeded tasks (i.e., accommodation), or (b) select themselves into different tasks which do not rely on the ability to perform speeded tasks well (i.e., selection). In contrast, difficulties with abilities that are perceived to be highly controllable may be met with more active forms of compensation (e.g., assimilation, substitution, or remediation).

One practical implication of these findings might involve an educational program designed to inform pharmacists about the type of work-related duties that are potentially controllable across time, as well as those duties which are expected to show normal age-related decline. Such a program would likely have an impact on pharmacists' beliefs about the degree of difficulty involved in overcoming problems occurring in the same list of work-related abilities. Consider, for example, a pharmacist who believes that performance on speeded tasks (e.g., pill counting and sorting) are highly controllable as one ages. Such an individual would also likely believe that problems with such speeded tasks should be quite easy to overcome (i.e., via active forms of compensation). Learning that this type of ability naturally shows age-related decline may lead the pharmacist to revise his or her expectations of controllability. Consequently, when such age-related declines begin to occur in speeded tasks, the pharmacist may be less likely to believe that addressing the decline is a simple matter of channelling more resources into the problem areas. Overall, this would save the pharmacist a great deal of time, effort, and ultimately disappointment where compensatory strategies are concerned. Rather than engage in active forms of compensation, the pharmacist may be more inclined to pursue other more adaptive forms of compensation (e.g., accommodation or selection).

The Chosen Forms of Compensation

Two hypotheses were suggested with regards to the selection of the forms of compensation. First, it was predicted that middle-aged and older pharmacists would produce more highly differentiated views as compared to younger pharmacists. Analyses failed to support this hypothesis. It may be that while middle-aged and older pharmacists have had more direct experience with age-related decline than younger pharmacists, it is still possible for members of each age group to form opinions about how such declines may be addressed.

Second, it was predicted that age effects would be observed with respect to the frequency with which the compensatory forms of assimilation, substitution, and remediation would be chosen. Middle-aged and older pharmacists were predicted to choose these forms of compensation more frequently than younger pharmacists. Analyses examining the frequency of selection of the various categories of compensation failed to indicate any age differences. However, findings did suggest that certain categories of compensation were selected more often than others. As is clear in Tables 24 and 25, the categories of compensation may be rank-ordered from most to least frequently selected, as follows: remediation, accommodation, assimilation, selection, and substitution. This would seem to indicate that pharmacists were predisposed to choosing an active strategy when dealing with most forms of decline (i.e., the category of remediation). In fact, when compared to the category of accommodation (a more passive form of compensation), pharmacists were almost twice as likely to select the category of remediation. Two reasons may exist for this preference for more active forms of compensation. First, as the pilot study results demonstrated, the list of pharmacy-related abilities was generally believed to be of better than average controllability. In view of this, it makes sense that pharmacists would indicate an active strategy of compensation most frequently when discussing options for addressing difficulties with this same list of abilities. Second, it may be argued that since one's career likely contributes to one's sense of identity and self-esteem, it is understandable that pharmacists would believe that their duties as a pharmacist would respond well to active compensatory efforts.

Despite the obvious preference for a more active form of compensation, it should be re-stated that declines inevitably begin to accumulate as a natural part of the aging process (e.g., mobility decline, sensory decline). Investing more time and effort (i.e., utilizing remediative compensatory efforts) would be an ineffective way of managing such declines. The fact that pharmacists endorsed remediative compensatory efforts most often may present a problem. Again, some form of educational program would be helpful in providing pharmacists with information as to how they may go about choosing the most effective forms of compensation when faced with declines occurring in various types of pharmacy-related abilities.

<u>The Perceived Effectiveness of Compensatory Strategies</u>

It was originally hypothesized that an Age by Expertise interaction would be found when examining participants' ratings of the perceived effectiveness of compensatory strategies (1 = very unlikely to be effective, 5 = very likely to be effective). The results did not support this hypothesis. However, significant differences were indicated between pharmacists and novices. In particular, pharmacists indicated more optimistic beliefs than novices about the effectiveness of the following compensatory strategies: try harder when performing tasks that become difficult with age, get more practice at the difficult tasks, seek more training or updating of skills, budget more time to spend on the difficult tasks, and modify your expectations - your performance does not have to be perfect. According to the pilot study results obtained in the present study, four of these compensatory strategies fall under the form of compensation referred to as remediation. In general, it would appear that pharmacists are more likely than novices to believe that more active efforts are likely to be effective in addressing work-related difficulties over time. This may be due to the fact that pharmacists (especially those middle-aged and older) may have had success in implementing these various strategies over the course of their careers, when faced with declining abilities. On the other hand, it also seems reasonable that pharmacists would believe that more active compensatory efforts are likely to be successful in managing declining work-related abilities. Such beliefs would bolster the pharmacist's sense of primary control. With this in mind, however, it is important to keep in mind that pharmacists also produced more optimistic ratings for one of the passive compensatory strategies (i.e., modifying one's expectations), which is representative of the accommodative form of compensation. This suggests that while pharmacists seem to prefer more active strategies when addressing declining abilities, they also recognize that in some cases certain declines must be yielded to.

In contrast, novices produced more favourable ratings of the perceived effectiveness of the following compensatory strategies: delegate difficult tasks to a younger person, avoid having to perform tasks that become difficult with age, find alternative tasks to concentrate on (rather than the difficult ones), explain to others that you are having some difficulties because of your age, and do more administration or organizational activities. According to the pilot study results obtained in this study, all of these compensatory strategies fall under the compensatory forms of selection and accommodation. The tendency of novices to favour these more passive forms of compensation may be due to the fact that they are not as aware as pharmacists of what is involved in carrying out the duties of a pharmacist. Because of this, novices would be less likely to have an understanding of the pharmacy-related abilities which would respond well to more active compensatory efforts. Without such first-hand knowledge and experience, it may be a "safe bet" for novices to favour compensatory strategies which emphasize the modification of goals, or the selection of alternative tasks. It also seems reasonable that novices may be less willing than pharmacists to consider more active strategies of compensation, as they do not have any personal investment in a career in pharmacy. In other words, if the average novice has no plans of becoming a pharmacist, he or she might not spend time thinking about how declines in pharmacy-related abilities may be actively managed.

Overall, it would appear that novices have a more practical set of preferences for compensatory strategies. As the gains:loss ratio decreases over time (with certain losses being inevitable and age-related), it would likely be more adaptive to consider compensatory strategies which focus on the modification of goals, or the selection of alternative tasks. Although it may be preferable to exercise what Heckhausen and Schulz (1995) refer to as "primary control" (i.e., more active ways of managing declines), such an approach may lead to frustration and disappointment when dealing with declines that are a normal part of aging. In contrast, the preference for the utilization of selection and accommodation expressed by novices, would be less likely to lead to such negative outcomes.

Overall Improvement versus Decline

When pharmacists were asked to comment on what pharmacy-related abilities were expected to change over time, it was observed that decline-oriented beliefs were significantly more prevalent than improvement-oriented beliefs. However, when the two follow-up probes were asked, it was observed that while the number of decline-oriented beliefs stayed fairly constant (at approximately two such beliefs), improvement-oriented beliefs rose dramatically to approach the number of decline-oriented beliefs. Two explanations for these findings seem highly probable. Specifically, it is quite probable that when pharmacists were asked for their beliefs about aging, reports of decline were offered almost as a "knee-jerk" reaction (i.e., their responses were most likely based on general schemata about aging). This may be the result of: (a) an understanding that aging is indeed associated with realistic types of mental and physical decline; or (b) the prevalence of decline-oriented stereotypes that are associated with aging. In other words, pharmacists, as members of the population at large, may associate aging with decline. However, when asked to consider what improvements are possible with advanced age, pharmacists were able to temporarily move out of the "decline-oriented mind set" and consider possible areas of growth. Overall, these findings may indicate that initially, pharmacists responses' were based on aging-related schemata, but subsequent responses (following probes) reflected a richer knowledge of the aging process.

Implicit Theories of Aging and Beliefs About Compensation - A Case for Relative Uniformity

Overall, when reviewing the hypotheses stated at the beginning of this paper, it becomes clear that the predicted Age X Expertise interactions did not materialize. In fact, the participants' implicit theories of aging and beliefs about compensation were relatively uniform throughout, with occasional differences found mostly between experts and novices. This may argue for the fact that broad cultural expectations define what forms the bulk of our implicit theories of aging. Some "fine-tuning" may understandably occur, however, based on the expert's greater familiarity with his or her area of expertise.

The Relationship of the Present Study to Other Research Areas

Where implicit theories of aging are concerned, this study follows similar trends reported by other researchers (e.g., Heckhausen et al., 1992), who have found evidence that beliefs about aging may be generally uniform among younger, middle-aged, and older age groups. If this uniformity is continually evidenced in future research which investigates the content of peoples' implicit theories of aging, monitoring for age differences may become less of a priority. However, the fact that occasional differences were observed between the beliefs of pharmacists and novices supports the notion that other factors (i.e., expertise) may play a key role in defining differences in peoples' implicit theories of aging within particular domains of specialization.

The findings from this study are also consistent with much of the literature which finds evidence of differences which exist between experts and novices. In particular, notable differences were observed between pharmacists and novices with respect to their choices of compensatory strategies (i.e., pharmacists preferred more active strategies versus the more passive strategies favoured by novices). Further, more subtle differences also emerged between pharmacists and novices with respect to the content of their beliefs, and the degree of differentiation present in those beliefs. For example, when discussing the abilities expected to change over time, pharmacists were more likely than novices to mention cognitive declines. Further, pharmacists used a greater number of words and personal elaborations than novices to describe their beliefs about the abilities that were expected to change. These subtle differences were most likely due to the pharmacist's acquisition of a larger domain-specific, procedural and factual knowledge base (Glaser, 1986; Salthouse, 1987).

With respect to the topic of compensation, the present study would seem to support the notion that a variety of compensatory strategies may be seen as viable in the face of declining abilities (e.g., assimilation, accommodation, selection, and remediation). However, it should be noted that the pilot study participants in the present study did not endorse the strategy of substitution. Two explanations may be offered to account for this finding. First, it is possible that the definition or the example used to describe the concept of substitution may have been confusing to the participants. The definition was written as follows:

> There is often more than one way or mechanism to perform a skill. If one mechanism begins to decline, an alternative substitutable mechanism may be used to maintain overall performance. For example, if you type rapidly through the mechanism of fast reactions and finger-tapping speed, you may be able to substitute another mechanism when these begin to decline.

If participants found either the definition or the example to be confusing, this would obviously have prevented them from selecting it. Perhaps the concept of substitution was not as easy to grasp as the remaining compensatory forms. If this was the case, pilot study participants may not have been willing to invest the time and energy needed to fully grasp the meaning of the concept of substitution. A second possibility is that pilot study participants understood the concept of substitution, but did not think that it was a viable strategy. Perhaps from a theoretical point of view the concept of substitution is useful in characterizing the full range of compensatory mechanisms available. However, where application is concerned, the lay person may not find the concept of substitution to be particularly useful or relevant. Future research may be useful in clarifying this issue.

The present study also finds support for the distinction between active and passive compensatory efforts. Pharmacists demonstrated a clear preference for a more active compensatory strategy (i.e., remediation), whereas novices favoured more passive strategies (i.e., accommodation and selection). This finding seems to support Brandstädter and Wentura's (1995) distinction between assimilative compensatory efforts (i.e., more active efforts), and accommodative compensatory efforts (i.e., more passive strategies). Future research is needed to determine whether experts reliably prefer more active compensatory strategies than novices.

General Conclusions

Overall, the present study has definite implications for the management of professional careers. Prior to discussing such implications, however, it would be appropriate to discuss the limitations of the present study, with respect to the generalizability of the findings.

Limits of Generalizability

This study involved participants who varied along two key dimensions of interest: age and expertise. Naturally, the findings of the study would be most generalizable to similar groups of individuals (namely younger, middle-aged, and older pharmacists and novices). It should be noted, however, that the participants involved in this study were: (a) community-dwelling residents of the greater Victoria area, and (b) willing to volunteer to participate in a research study. These two characteristics alone reflect a sample of individuals who are not representative of the *entire* population of pharmacists and novices in the greater Victoria area, which should be taken into account when making generalizations. Further, generalizations to similar groups of individuals outside of this region would be somewhat limited for several reasons. For example, regional and cultural differences which are prominent in other geographical locations may have a bearing on peoples' implicit theories of aging. For example, individuals living in Asian cultures have different views about aging when compared to individuals who are exposed to the cultural norms found in North American society (e.g., Chang, Chang & Shen, 1984; Palmore, 1975).

Bearing these cautions in mind, however, it may be possible to make limited generalizations to groups of individuals living in other locations, who are similar to the groups of individuals involved in the present study. This assumes that similar conditions exist elsewhere with respect to: (a) regulations for operating pharmacies; (b) the ethical and educational demands required of pharmacists; (c) the rate and degree of change in the pharmacy industry; and (d) the average client-load managed by pharmacies.

Further, it should be acknowledged that the results of the present study may also be somewhat applicable to individuals involved in other professions. A discussion of this issue will now be addressed.

Managing Professional Development

The findings of the present study may be somewhat generalizable to individuals involved in other *health-related* professions (e.g., medicine, nursing). Marked similarities exist between pharmacists and doctors or nurses. For example, the duties of doctors and nurses involve clusters of abilities which are similar to those mentioned in this study (i.e., abilities related to local knowledge, communication, administration, professional responsibility, cognitive performance, speeded performance, and updating). In light of this, similar findings may be found when studying the beliefs of doctors or nurses regarding: (a) the work-related abilities of an aging peer; or (b) issues related to compensation in the face of declining work-related abilities. Further research might explore the question of whether the current findings would be replicated in similar groups of individuals working in other health-related fields.

The results of this study may also have practical implications for the management of professional careers. Given the findings of this study, it may be useful to ask members of a given profession to express their beliefs as to how their work-related abilities are expected to age. This would allow for an examination of the veridicality of the age-related expectations. For example, if a doctor expressed the belief that his or her ability to perform tasks quickly would decline across adulthood, this would represent a veridical belief. However, if the doctor believed that his or her ability to perform speeded tasks would improve across later adulthood, this would be contradictory to established patterns of aging. Some form of education could then be offered to inform the physician as to how tasks which involve speeded responses typically age.

This type of education would also have a beneficial effect where compensatory strategies are concerned. In the example given above, the physician who has been informed that the ability to perform speeded tasks declines across adulthood will be less likely to engage in compensatory strategies which focus on actively meeting the decline (e.g., remediation). Instead, the doctor may be more likely to engage in the compensatory forms of selection or accommodation. Overall, this would translate into a savings of time and energy, and would allow for a more successful management of the physician's professional career.

Future research may examine the possibility of outlining the compensatory forms which would be most successful in addressing specific work-related declines.

Other Avenues for Future Research

In addition to the possible areas of future research mentioned above, three additional cases will now be discussed. First, further research may investigate whether factors other than age or expertise may affect participants' beliefs about aging. For example, participants coming from different socioeconomic backgrounds might likely carry different views about age-related changes. Consider the contrast of an individuals coming from a lower socioeconomic background who may not have access to adequate nutrition, education, or health care, in comparison to a "privileged" individuals who enjoys such benefits. Disadvantaged individuals may be more likely than those who are privileged to believe that declines occuring with age are more pervasive and less controllable.

Second, future research might explore whether certain individual differences play a role in shaping peoples' beliefs about aging. In the context of compensation, Brandtstädter and Wentura (1995) have discussed two such measures: Tenacious Goal Pursuit (TGP) and Flexible Goal Adjustment (FGA). The former measure involves an individual's tendency to continue working towards goals, despite obstacles and setbacks. The latter measure indicates one's readiness to disengage from unatainable goals, and instead focus on the positive aspects of difficult situations. Both of these measures may play a role in shaping people's beliefs about compensatory measures. For example, if an individual scores quite high on the TGP measure, and low on the FGA measure, he or she may be highly likely to endorse active compensatory measures, even when discussing age-related declines which are perceived to be less controllable. Information on individual differences such as these may be gathered and used as covariates in statistical analyses.

Finally, whereas the current research project involved determining the profile of participants age-related beliefs (i.e., establishing which abilities were expected to improve versus decline), future research may also choose to investigate the *degree* of improvement or decline inherent in participants age-related beliefs. Consider the following possibility: An individual who indicates that declines are expected to occur in vision and memory may believe that decline in the former is generally believed to occur to a moderate extent, whereas decline in the latter is expected to be quite severe. By including a focus on the degree of improvement or decline that is expected for various abilities, one may acquire a more detailed description of participants' age-related beliefs. Further, this more detailed description may be explored in relation to participants' beliefs about compensation. It may be the case that declines that are expected to be less severe are generally believed to be easier to overcome, and therefore met with more active compensatory efforts.

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