Running Head: A Metacognitive Model

Older Adults' Use of Memory Strategies and Self-Reported Medication Compliance: A Metacognitive Model.

By

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Abstract

Fifty community-dwelling adults aged 51-83 years of age (M=70.1, SD=7.61) reported their medication compliance and their use of memory strategies. The first goal of the present study was to replicate Gould McDonald-Miszczak, and King's (1997) research on older adults' use of memory strategies to aid medication compliance. As in the Gould et al. (1997) study, older adults reported using internal strategies more often than external strategies for medication compliance, and the use of strategies was predicted by metamemorial variables ($p<.05$) rather than by objective health related factors. The second goal of this study was to extend the research by Gould et al. (1997), who found that metamemorial variables, rather than objective medical factors, were significant predictors of self-reported medication compliance. The present study used a new self-report measure of compliance, and examined cognitive performance in addition to health related and metamemorial assessments. The self-report measure of compliance was tied more to objective health factors than to subjective beliefs, as medical factors contributed significantly to the prediction of self-reported compliance ($p=.05$). Finally, a metacognitive path model specific to self-reported compliance was tested, and the importance of compliance, a belief laden variable, predicted self-reported compliance through prospective strategy use. The results of this study suggest that medication compliance is a complex mixture of both objective health related factors and subjective metacognitive assessments.

Chapter One: Introduction

Older Adults' Use of Memory Strategies and Self-reported Medication Compliance

There are declines in the natural aging process and often disease processes can accompany later life. However, in order to facilitate a high quality later life, many of these declines can be effectively treated with the proper use of medications. Older adults often require multiple medications for numerous chronic conditions and as the number of medications increases, so does the complexity of the medication task. This increasing complexity often leads to decreasing compliance.

Lower compliance with medication instructions can lead to lower drug effectiveness along with many other negative effects. Nevertheless despite these negative effects, noncompliance with medication regimens is quite common. The use of memory strategies, however, can often improve compliance in older adults. Although the usefulness of many memory strategies for older adults has been demonstrated, very little is known about the strategies that older adults choose to employ outside the laboratory, or about why these strategies are chosen to aid compliance with medication regimens.

There are many ways to measure medication compliance. However the most commonly used method of measuring compliance is the self-report and, unfortunately, this is not always the most accurate method. While many studies investigate the accuracy of compliance measures, including the self-report and other more accurate measures using new technology, very few attempt to improve the accuracy of the commonly used self-report measure of compliance. Yet it is the self-report on which many physicians and older adults routinely base important medication decisions, and consequently, it is the self-report that needs to be investigated in order to improve its accuracy. The three goals

of the present study are to replicate Gould et al.'s, 1997 research on older adults' use of memory strategies, to extend their research through examination of a new self-report measure of compliance, and to test a metacognitive path model specific to self-reported compliance.

An Aging Population

Older adults make up a large part of our population, and the proportion of older adults is constantly increasing (Facts on Aging in Canada, 1996; Statistics Canada, 1997) in most parts of the world (Shuman, 1987; Woodruff-Pak, 1988). In has been projected that, between 1975 and 2025, the global population of older adults will have increased by 350% (Shuman, 1987). Adults over 55 years of age made up 21% of Canada's population in 1998, and are expected to make up over 28% and 34% of the population by the years 2016 and 2026 respectively (Statistics Canada, 1997).

Not only has the proportion of older adults in our society been increasing, but life expectancy has also been increasing (Fries, 1990). People can now look forward to an optimal life expectancy of approximately 80 years (Statistics Canada, 1992b); an increase of 28-38 years since the turn of the last century (Fries, 1980; 1990). For those people born between 1990 and 1992, life expectancy is 78 years and 81 years for men and women respectively (Statistics Canada, 1992b). More than ever, older adults comprise a large segment of our population.

There is some controversy over the projection of future life expectancy. However, whether life expectancy continues to increase into the 21st century (U.S. Bureau of the Census, 1989) or whether the increases in future life expectancy will begin to slow (Fries,

1980; 1990), people spend more time as older adults today, and the population of older adults overall is expected to increase. The increasing number of older adults in our society makes it clear that the issues concerning older adults will be of tantamount importance in the coming decades.

Aging and Health

One issue that is very important to older adults is the issue of maintaining health with increasing age. However, both physical and cognitive health can decline with age, and in the face of these declines, it can become increasingly difficult for older adults to enjoy the benefits of later life. Older adults experience less acute disease than younger adults however, over the past century, the national illness burden has shifted from acute to chronic illness (Fries, 1990). Chronic heart disease and arthritis have been reported to limit the activity of almost one quarter of older adults (Lamy, 1980). Approximately 80% of deaths due to circulatory diseases, cancer, and respiratory diseases are in adults over 65 years of age, and older adults account for 65% of the days spent in hospital for these same chronic diseases (Statistics Canada, 1994).

Often, later life is a time of new found freedom from work and family responsibilities, and frequently older adults use this freedom for travel and the pursuit of other interests. However, due to declines in physical health, many older adults experience difficulty with everyday tasks. In a sample of 28,000 older adults, Leon and Lair (1990) found that over 3,600 had difficulty with at least one activity of daily living (ADL), primarily with bed and chair transfers, bathing, and walking. Almost 50% of older adults report that their activities are limited due to chronic illness (Everitt & Avorn, 1986). Due

to declines in cognitive health, many older adults experience frustration and difficulty with daily tasks that involve memory. Indeed, despite the accumulation of years of wisdom and experience, older adults often report difficulty with their memory as one of their primary concerns with aging (Moscovitch, 1982).

Aging and Medication

Over time and with increasing age, the average number of chronic conditions suffered often increases, and interferes with the active and fulfilling lifestyle many older adults enjoy. Such chronic conditions often require long term treatment which frequently includes the use of medication. Medications are "one of the most effective and efficient medical technologies when used correctly. They are used to treat various afflictions, to relieve symptoms and pain, to reduce the number and duration of hospital stays and to prevent painful and stressful procedures." (Government du Quebec, 1995, p. 9). Medications are the most commonly used health treatment in North America (Chaiton, Walter, Spitzer, Roberts, & Delmore, 1976), and they are even more common among older adults (Government du Quebec, 1995; Miller, 1991).

Older adults in Canada represented 12.4% of the population in 1999, or almost 3.8 million people (Statistics Canada, 2000). When older adults represented only 11-12% of the total population, these older adults consumed from approximately 30% (Delafuente, 1991; Miller, 1991) to 50% (WHO, 1981 cited in Park et al., 1992) of prescription drugs, and accounted for approximately 25% of the total national expenditure for medications (Vestal, 1990). Up to 75% of older adults report using prescription drugs on a regular basis (Helling, Lemke, Semla, Wallace, Lipson, & Cornoni-Huntley, 1987; Ostrom,

Hammarlund, Christensen, Plein, & Kethely, 1985). This is consistent with reports that 80% (Delafuente, 1991; Simonson, 1984b; Swonger & Burbank, 1995) to 86% (German, Klein, McPhee, & Smith, 1982) of older adults suffer from at least one chronic condition which requires medication. Further, the average amount of overall and prescription medication use has been shown to increase with age (Helling et al., 1987).

When looking at older adults and medication use, it is important to remember that older adults suffer from more health conditions than younger adults and as a result, they will tend to legitimately use more medication than the general population. Older adults report suffering from up to three (Darnell et al., 1986) times more medical conditions than the rest of the population, and this is consistent with reports that older adults use two to three times more prescription medications (Health and Welfare Canada, 1981; 1990; Wells, Kamberg et al., 1985) .

A variety of researchers have examined physicians' prescription patterns, and the estimates of medical visits that result in a prescription range from 28% up to 75% (Davidson, Molloy, Sommers, & Bedard, 1994; Gibson & Waldo, 1981), with the highest prescription averages for older adults. These high prescription rates, coupled with the many visits older adults make to see their physicians (Minister for Senior Citizens Affairs, 1985; Statistics Canada,1990; 1991), result in large amounts of medication consumption by older adults. The average community dwelling older adult has been reported to fill as many as 11 prescriptions per year (Shimp, Ascione et al., 1985; Unpublished study cited in Philion, 1988).

Over 90% of older adults are using at least one prescription medication (Hale,

May, Marks, and Stewart, 1987; Health and Welfare Canada, 1981) with the average older adult using anywhere from two to four prescription medications at one time (Hale et al., 1987; Health and Welfare Canada, 1981; Helling et al., 1987; Ostrom et al., 1985; Simonson, 1984b).

Aging and Medication Compliance

Prescription medications can contribute much to the lives of older adults if they are taken properly. Compliance with medication implies compliance with the verbal or written "instructions provided regarding the use of medication" (Miller, 1991, p. 46). A variety of compliance rates have been demonstrated for different medications due to a number of factors, however compliance rates overall tend to be quite low (Weibert & Dee, 1980).

Noncompliance is assumed to be more likely if the patient is very old (Blackwell, 1973; Park, et al., 1992), yet Christensen and Smith (1995) have reported that older patients demonstrated significantly higher compliance than younger patients in their sample. Further, it has been noted that "There is a persistent misconception that the elderly have a higher rate of noncompliance than younger patients" (Miller, 1991, p. 46) and that "Reexamination of earlier literature indicates the rate of compliance in the elderly is similar to that in patients of all age groups" (Miller, 1991, p. 46-7; see also Boczkowski & Zeichner, 1985). However, the reasons for noncompliance may be different for older adults than they are for younger adults, with cognitive factors possibly playing a larger role in noncompliance for older adults (Morrell, Park, & Poon, 1989). Regardless of the presence or absence of age differences, it remains an important fact that

older adults require more medications than the general population to maintain an active and healthy lifestyle, and that many are not compliant with their medication regimens. This noncompliance needs to be understood, and looking at cognitive factors may help to clarify the nature of noncompliance in older adults (Morrell et al., 1989). Opdycke, Ascione, Shimp and Rosen (1992) examined a pharmacist intervention program for older adults and found that two of the top three problems identified by pharmacists for this sample were non-compliance and inappropriate drug use.

Errors in compliance can be divided into two categories: errors of omission (i.e., missed doses), and errors of commission (i.e., taking too much medication, taking the wrong medication, or taking the medication at the wrong time). There is a large gap between the two types of medication errors such that errors of omission are much more common than errors of commission (Bernstein, Folkman, & Lazarus, 1989; Col et al., 1990; Park et al., 1992; Swonger & Burbank, 1995). More specifically, Park and her colleagues reviewed the literature in 1992 and reported that errors of commission were as low as 2% while errors of omission ranged from 15% up to 47%. Among those participants who were noncompliant in a 1991 study, 70% made errors of omission while only 30% made errors of commission (Graveley & Oseasohn).

Studies have shown that from one-third to over one-half of older adults demonstrate some form of noncompliance with their medications (Botelho & Dudrak, 1992; Carney, Freedland, Eisen, Rich, & Jaffe, 1995; Isaac, Tamblyn, & McGill - Calgary Drug Research Team, 1993; Morrow, Leirer, & Sheikh, 1988). Boczkowski and Zeichner (1985; see also Simonson, 1984a) reported that it has been consistently

documented that regimen complexity (i.e., number of different pills per day and number of doses per medication) contributes to noncompliance. Indeed, many studies have found that self-reported noncompliance increased with regimen complexity or number of medications taken (Bernstein et al., 1989; Blackwell, 1973; Botelho & Dudrak, 1992; Col et al., 1990; Conn, Taylor, & Kelley, 1991; Darnell et al., 1986; Graveley & Oseasohn, 1991) though some have not found this relationship (Isaac et al., 1993; Park et al., 1992). The relationship between regimen complexity and noncompliance has been well explored, and it is clear that older adults are at risk for noncompliance with important medication regimens due to the high number of medications taken by the average older adult.

Negative Effects of Noncompliance

Noncompliance in older adults has many negative consequences including ineffective therapy, adverse drug reactions, higher rates of hospital admission, increased out-of-pocket expenses, and higher social health care costs through increased length of hospital stay and the prescription of additional medications. The accumulation of left-over medication is another dangerous result of noncompliance (Simonson, 1984a). Many of these consequences pose serious health risks to the older adult and place undo strain on the health care system.

Adverse Drug Reactions (ADRs)

It is important that older adults comply with their medication regimens, not only for the primary benefit of their therapy, but also to avoid Adverse Drug Reactions. ADRs may be exacerbated by primary (normal changes in physiology), secondary (other changes

in physiology that may interact with primary factors), and tertiary (psychosocial stress) aging factors. Any of these factors related to aging may interact with pharmacologic factors and ADRs can result. (For a review of the general effects of aging on pharmacokinetics see Miller, 1991; also see Greenblatt, Sellers, & Shader, 1982). The risk of an ADR increases with the number of medications being taken (Col et al., 1990). Risk factors include taking more than four medications and documented compliance problems before hospital admission (Schneider, Mion, & Frengley, 1992). As described earlier, many older adults routinely take more than four medications at one time and are, therefore, at increased risk for hospitalization due to ADRs. Further, many older adults have demonstrated substantial compliance problems, and are consequently at even greater risk for ADRs. Indeed, studies show an increase in ADRs with increasing age (Everitt, & Avorn, 1986; Government du Quebec, 1995; Greenblatt et al., 1982). Those over 70 years of age are reported to suffer from ADRs three times more than adults under 50 (Smith et al., 1994), and 51% of those who die from ADRs are over 60 years of age (Butler, 1989).

Out-of-pocket Costs for Older Adults

Not only does the health of an older adult suffer with noncompliance, but there is also a considerable financial loss that accompanies noncompliance. The cost of medicinal and pharmaceutical products is high and rising. When observed over several years by the Consumer Price Index in 1992, medicinal and pharmaceutical products were listed as having above average price increases (Statistics Canada, 1992c). Even during a time of cuts to health care spending in Canada, drug expenditures have increased rather

than decreased in the past decade (Naylor, 1999). An estimated 20% of Canadian older adults' out-of-pocket expenses in 1990 were for medications (The Health and Activity Limitation Survey, 1990). Out-of-pocket expenses for prescription medication for older adults in the early 1980's doubled the expenses for the total population (including the older adults) for all expenditure categories over $50 (Kasper, 1982). In Canada in 1996, the average person was responsible for 64.8% of medication expenditures (Naylor, 1999).

Social Healthcare Costs

The financial burden for noncompliance with medications falls not only on the older adult, but also on each member of our society. Much of the taxpayer's social health care dollar goes toward the research and provision of medication for older adults. The Pharmacare system in British Columbia keeps track of the prescription behaviours of older adults in that province. In 1989 the 316,000 adults over 65 years of age filled 4.25 million prescriptions, at a cost of $91.4 million (Stevenson, Kellogg, Ernst, & Whinney, 1989). In 1995, $9.3 billion was spent on medications in Canada (Statistics Canada, 1997), and three billion dollars a year in medication goes to older adults in the United States (Vestal, 1990).

For older adults in Quebec in 1992, the medication expense was $75 million more than the expenditure for medical services. Between 1977 and 1992, the budget for medication grew almost 17% annually, and older adults were the recipients of the largest portion of that growth. This growth in the budget for older adults was not entirely justified by a simple increase in population, as the population increased by only 3.1% while the average cost of medications increased by 11% (Government du Quebec, 1995).

This represents an increase in the financial burden, both for tax payers and for the individual older adult who needs the medication, although the distribution of that burden varies from province to province (Naylor, 1999).

Noncompliance with progressively more expensive medications will lead to increased costs to the health care system as it continues to research and help provide medication for those who need it. Regardless of how effective any medication proves to be, if it is not taken properly the money has been wasted and the therapy will be ineffective. Further, noncompliance with medication may lead to costly hospitalization, and to further prescriptions in an effort to achieve therapeutic results.

Hospitalization for Noncompliance and ADRs

Hospitals in Canada are sustaining a substantial decrease in funds due to cuts in health care spending (Naylor, 1999), and unnecessary hospital admissions could be contributing to the financial burden in Canadian hospitals. Col et al., (1990) reported that almost 33% of hospital patients disclosed a history of medication noncompliance; because this figure was obtained by self-report it is likely to be a conservative estimate of noncompliance. With approximately 10% (Col et al., 1990) to 27% (Grymonpre, Mitenko, Sitar, & Aoki, 1988) of hospital admissions estimated to involve noncompliance, and 10% to 23% (Col et al., 1990; Grymonpre et al., 1988; Nolan and O'Mallley, 1988) of hospitalizations estimated to involve ADRs with prescription medication, it is clear that there may be a considerable hospitalization cost to the health care system when medications are not taken properly. For example, Statistics Canada (1997) reported a hospitalization cost of almost $26.5 billion for 1995. Applying the

above statistics to this example, noncompliance or ADRs could possibly have accounted for an estimated $13 billion health care dollars in a single year. Further, in 1994 public funds accounted for 85% to almost 90% of the health care budget for inpatient and acute care in Canada (OECD, 1996).

Additionally, in the United States 200,000 older adults were estimated to be in the hospital with ADRs in 1987 and "Thirty-nine percent of all those hospitalized for drug reactions were elderly, according to Kusserow's citation of the 1988 hearings on drug abuse in the elderly by the U.S. Senate Special Committee on Aging." (cited in Smith et al., 1994). Applying a staggering average cost of $2,150 per hospital admission (Col et al., 1990) to this example, an estimated total of $430 billion could have been incurred for ADR related hospital admissions for older adults in the United States in 1987. It has been reported that up to 76% of older adults' hospitalizations due to ADRs can be avoided (Bero, Lipton, & Bird, 1991). In this example alone, that would have been an estimated savings of almost $327 billion in a single year, not to mention better quality of life for 152,000 older adults.

When hospitalization costs are broken down into daily units, they can be quite high. For example, in the United States as far back as 1980 the estimated cost per day in the hospital was $245 (American Hospital Association, 1981). In Canada the average cost per day in the hospital was reported to be $514.76 in 1992 (Statistics Canada, 1992a). The average length of stay for the general population in Canada in 1996-1997 was 10 days (Statistics Canada, 1998a). A significant amount of hospital admissions and readmissions are for older adults with chronic conditions, and when older adults are

admitted to the hospital, they tend to stay almost twice as long as the general population, with an average of between 17 to 21 days (Statistics Canada, 1991). Based on the cost per day in 1992 in Canada (Statistics Canada, 1992a), the extra ten days spent in the hospital by the average older adult could cost approximately $5, 000 more per admission than the general population. However, older adults tend to receive less high tech and expensive treatment when in hospital. For example, older adults are less likely to be given surgeries or expensive screening tests, and are more likely to be prescribed medications. Therefore, the actual cost for an older adults' longer hospital stay is likely less than that of young adults.

The longer the hospital stay, and the older the patient, the more prescriptions the patient takes home with them on discharge (Vestal, 1990). This increases the possibility of more complex medication regimens, subsequent drug interactions, ADRs, and readmission to hospital for drug related symptoms. As a result, hospital admissions for older adults due to noncompliance or ADRs can serve to compound the original problem of medication noncompliance. It should be noted, however, that because of budget cuts, staff shortages, and more efficient medical treatment hospital stays are becoming shorter for most adults, older or younger.

Understanding Compliance

It must be understood that the task of compliance is not as straightforward as it may seem because there are many factors that can contribute to noncompliance. Before any attempt is made to equip older adults for medication compliance, an attempt must be made to simply understand the complexity of the task.

Although on the surface the task of remembering to take medication appears to be relatively simple, medication taking can be viewed as a complex memory task involving both cognitive and metacognitive factors. The cognitive component of compliance imposes a heavy memory demand which can include both prospective memory (memory for future events), and retrospective memory (memory for past events; Einstein & McDaniel, 1990; 1996; Park, 1992). The use of memory aids as a compensatory mechanism can help to alleviate this cognitive demand (for a review see Park & Kidder, 1996), however the spontaneous use of memory aids by older adults to aid in medication compliance has only begun to be researched (Gould et al., 1997).

Adding to this already complex task is the metacognitive component of medication compliance (Park & Kidder, 1996; Park, Willis, Morrow, Diehl, & Gaines, 1994). Metacognition can include both a knowledge base (factual memory and self-knowledge regarding memory) and a belief base (memory self-efficacy and memory related affect; Hultsch, Hertzog, Dixon, & Davidson, 1988). It is thought that these metacognitive factors do not merely reflect one's perception of past memory performance, but that metacognition impacts future memory performance (McDonald-Miszczak, Gould, & Tychynski, 1999).

As people age, more chronic conditions lead to the need for more medication. More medication also means more complex medication regimens which create a heavier cognitive demand on the older adult for adherence to medication regimes. Given that increasing medication complexity increases the memory demand on older adults and complicates the metacognitive component of compliance, it is no surprise that many

studies demonstrate decreasing compliance with increasing regimen complexity, and that many older adults are turning to the use of strategies to compensate for this increased cognitive demand in the face of cognitive decline.

The Cognitive Component of Compliance

A decline in memory performance for older adults has commonly been implicated as one of the factors related to non-compliance with medication regimens, and medication compliance has often been described as a real life prospective memory task (Einstein & McDaniel, 1990; Gould et al., 1997; Park & Kidder, 1996). Prospective memory is broadly defined as memory for future events (Einstein, & McDaniel, 1990), and remembering to take a medication at some specified point later in the day is clearly such a task. Some researchers however, have suggested that medication compliance is not strictly a prospective memory task, but rather a complex mixture of cognitive (Park, 1992; Park et al., 1992) and social factors (Park & Kidder, 1996). One particularly important component of prospective memory performance is retrospective memory, or memory for past information (Einstein & McDaniel, 1990;1996). In the case of medication compliance, once the specified time has arrived for the compliance task to occur, retrospective memory is necessary to recall the details of the medication regimen. Correct compliance will not have occurred, for example, if the older adult takes the wrong medication at the "correct" time. Therefore it is important not only to consider prospective memory performance, but also retrospective memory performance when looking at the complex task of medication compliance.

Prospective memory. Prospective memory is memory for future events (Einstein & McDaniel, 1990; 1996), and in the case of medication compliance, the primary prospective concern is for when a medication is to be taken. An example of medication compliance as a prospective memory task is simply remembering to take your medications at a particular time later in the day, for example 4:00 p.m. The task becomes more demanding, however, as increasing amounts of medication are involved. Recall that the average older adult takes from two to four medications at any given time, and to use a realistic example of the prospective task of medication compliance, this must be taken into account. Prospective memory for such a medication regimen could involve remembering to take not only that medication at 4:00 p.m., but also one at 10:00 a.m., one at 8:00 p.m. and another one at 10:00 p.m. Clearly, there is a progressively heavier prospective memory demand in the task of medication compliance with increasing amounts of medication, and one must consider older adults' prospective memory performance to understand older adults' medication compliance.

Prospective memory can be either time based or event based. A time based prospective memory task requires a person to remember to do something at a specific time in the future, as in the example above when a person must remember to take medication at 4:00 p.m. An event based prospective task involves remembering to perform an action when a particular event or cue occurs. For example, the person in the above example may go to bed every night at 10:00 p.m. The bedtime event becomes a memory cue for medication taking. The prospective memory task has become an event based rather than a time based memory task (Maylor, 1990; Park & Kidder, 1996). Time

based prospective tasks are thought to be more difficult than event based prospective tasks because they are considered to be higher in self-initiated retrieval, and therefore more demanding (Craik, 1986).

It is often reported that older adults outperform younger adults on both time based and event based prospective memory tasks when they have employed the use of external memory aids. Younger adults also perform more effectively on prospective memory tasks (e.g,. mailing postcards at a particular time) with the use of strategies or memory aids (Meacham & Leiman, 1982; Meacham & Singer, 1977). However, older adults have consistently performed at least as well as, and most often better than, younger adults on the naturalistic time based task of making telephone calls at a specified time, and they usually report the use of strategies in accomplishing this task (Devolder & Presley, 1992; Maylor, 1990; Moscovitch, 1982; Poon & Schaffer, 1982; West, 1988). Yet, Einstein, McDaniel, Richardson, Guynn, and Cunfer (1995) reported that older adults did not perform as well as younger adults on a laboratory time based prospective task without the use of memory cues. They did report however, that older adults performed at least as well as younger adults on event based prospective memory tasks in the laboratory. The memory cue in this task was a target word embedded in a short term memory task. Similarly, Einstein and McDaniel (1990) reported that older adults outperformed younger adults on event based prospective tasks when participants were allowed to construct and use a memory cue, however older adults performed as well as younger adults even without the use of memory aids. Yet in another laboratory setting, West (1988) found that younger adults performed better than older adults on event based memory tasks. The

authors felt that they provided a rich situational memory cue for the event based task (i.e., a sentence signaling the end of the interview and a folder on the desk). However this study was slightly different from most prospective memory studies as the cues provided were generated by the researcher and not by the participant, further the cues provided were not particularly salient cues when given in a laboratory setting.

Lack of memory cues for time based prospective tasks have resulted in poorer memory performance for older adults in both naturalistic (Maylor, 1990; Moscovitch, 1982) and laboratory (Einstein et al., 1995) settings, though not always lower performance than younger adults. Further, the use of memory cues has resulted in better performance for older adults for not only time based, but also event based memory tasks which already have a built in memory cue. Happily, most research suggests that with the use of memory cues older adults are able to perform as well as, or better than, younger adults on both time and event based prospective memory tasks.

Despite this evidence that older adults can perform very well on prospective memory tasks, when it comes to the prospective task of medication compliance, omission errors (prospective memory errors) are very common. As discussed earlier, they are far more common than errors of commission, and this suggests that the prospective component of medication compliance may be especially important for older adults (Park et al., 1992). Further, according to the studies cited above, it is usually with the use of memory aids that older adults successfully outperformed younger adults on prospective memory tasks. Similarly, in the case of compliance with pseudo medication regimens, older adults have shown higher levels of compliance with training in the use memory aids

with a prospective component (Leirer, Morrow, Pariante, & Sheikh, 1988) and with the provision of telephone voice mail reminders as a prospective memory aid (Leirer, Morrow, Tanke, & Pariante, 1991). Further, Palmer and Dobson found that older adults who failed to progress in a self-medication program had received a score of zero on Pajurkova and Wilkins' (1983 cited in Palmer & Dobson, 1994) prospective memory task. Given the improved prospective memory performance of older adults with the use of memory aids on naturalistic memory tasks, laboratory memory tasks, and pseudo medication memory tasks, older adults' unintentional omission errors in medication compliance are prospective errors that can possibly be avoided simply through the use of effective memory aids.

Retrospective memory. An important component of prospective memory is retrospective memory, or memory for past information or events (Einstein & McDaniel, 1990; 1996; Park & Kidder, 1996). Prospective remembering to take a medication is only the first step, and once this is accomplished, retrospective remembering of how to take what amount of which medication must also occur. In our earlier example, when 4:00 p.m. arrives, the older adult needs to remember to take two blue pills on an empty stomach, and to make sure s/he doesn't eat for one hour afterwards. Of course, for the average older adult, s/he also needs to remember to take one pink pill, on a full stomach at 10:00 a.m., two yellow pills with food, but not with milk at 8:00 p.m., and one green pill on an empty stomach at 10:00 p.m. Further, s/he needs to remember that certain foods, over-the-counter medications, or even activities should be avoided with some of these medications. The task of compliance clearly becomes more complex with each

additional medication, and the cognitive demand becomes more weighty. Therefore it is important not only to consider older adults' prospective but also their retrospective memory performance in order to understand medication compliance in this population.

Older adults have consistently demonstrated deficits in retrospective cognitive performance both in the laboratory (Hultsch & Dixon, 1990; Salthouse, 1989; 1991a; 1991b) and in the context of medication compliance (Park et al., 1994). Kausler (1989) argues that the type of memory task (i.e., effortful vs. automatic) and the external validity of the task may serve to accentuate or attenuate age differences. However, decline in performance has been demonstrated in a variety of areas including working memory (Hultsch, Hertzog, Small, McDonald-Miszczak & Dixon, 1992), operational capacity (similar to working memory; Salthouse & Mitchell, 1989), memory speed (Hultsch, Hertzog, Small, McDonald-Miszczak, & Dixon, 1992), visual memory (Isaac et al., 1993; Park, Smith, Morrell, Puglisi, & Dudley, 1990), recall of word lists (Devolder & Pressley, 1992; Isaac et al., 1993; McDonald-Miszczak, Hunter, & Hultsch, 1994), digit span (Isaac et al., 1993), free recall (Einstein & McDaniel, 1990), recognition (Einstein & McDaniel, 1990), face-name learning (Devolder & Pressley, 1992), recall of names and personal information in a social context (West & Clark, 1998), and in the retrospective component of prospective tasks (West, 1988). Most of this research is cross-sectional, and therefore it confounds age with cohort effects. The effects described above could be due to cohort rather than age, therefore it cannot be concluded from this research that retrospective memory ability declines with age. It is clear, however, that older adults have demonstrated difficulty with retrospective memory performance.

The ability to recall medication information can impact compliance behaviour, thus difficulty with retrospective memory performance can have a negative impact on medication compliance. Older adults have been reported to remember as little as 54% of medication instructions from their physicians immediately following their visit with the doctor, and 30% of patients interviewed failed to recall a newly administered medication despite the fact that they had the new prescription with them at the time of the interview. Further, 82% of these participants failed to recall instructions to discontinue medication during the preceding visit (Rost & Roter, 1987). Col et al., (1990) reported greater noncompliance with poor recall of medication regimen. Palmer and Dobson (1994) found that retrospective memory performance (i.e., cued recall) predicted both prospective and retrospective components of patients' ability to progress in a self-medication program. Further, older adults have been shown to have poorer memory performance and poorer comprehension than younger adults for new medication information (Morrell, Park, & Poon, 1989; 1990), and it is the older adult who has more medication information to recall.

Thus it can be seen that retrospective memory plays an important role in the complex task of medication compliance, and older adults consistently demonstrate lower cognitive performance than younger adults in this area. Unfortunately, difficulty with retrospective memory performance comes at a time when the cognitive demand of medication compliance becomes more complex with increasing amounts of medication being prescribed for older adults. Taking the wrong medication or not recalling accompanying instructions because of poor memory performance leads to unnecessary

noncompliance, and could render the medication therapy ineffective, or even lead to ADR's or other complications resulting in costly hospitalization and negative health consequences. The retrospective component of medication compliance is an important part of the prospective task of compliance, and in light of age differences in retrospective memory performance for older adults, it seems fitting to consider whether aids and memory strategies can assist older adults in this area.

The Role of Strategy Use in Medication Compliance

According to Park et al., (1992) medication behaviors have not been linked directly to cognitive processes. However, aids to cognitive processes have been shown to improve compliance behaviours. Research has been conducted to determine the usefulness of a variety of memory aids both for memory performance in general and for medication compliance specifically. For certain measures of memory performance, this research has included contextual integration (Park et al., 1990) and various forms of memory training (Lachman, Weaver, Bandura, Elliott, & Lewkowicz, 1992; Stigsdotter, & Backman, 1989). For medication compliance, this research has included memory aids such as telephone voice mail reminders (Leirer, Morrow, Tanke et al., 1991), bottle cap alarms (Machowiak et al., 1994), organizing medication information for easier recall (Morrow, Leirer, Alteri, & Tanke, 1991), a variety of pill box organizers (Mackowiak et al., 1994; Park, Morrell, Frieske, Blackburn, & Birchmore, 1991; Park et al., 1992), organization charts (Park et al.,, 1992), and easy to use mnemonics for memory training (Leirer et al., 1988). The use of memory aids has generally been successful for improving memory performance both for laboratory memory tasks and for medication compliance,

though not all have found this relationship between compliance and the use of memory aids (Graveley & Oseasohn, 1991). The use of multiple memory aids has been reported to be more effective than the use of just one aid to improve performance for both laboratory memory tasks (Stigsdotter & Backman, 1989) and medication compliance (Park et al., 1992).

However, despite the demonstrated effectiveness of memory strategies for improving medication compliance, people are not likely to continue to use these strategies for long after the study has concluded (Cornoldi, 1988; Herrmann, Rea, & Andrzejewski, 1988). It is important to keep in mind that strategies will only be useful to older adults as memory aids if they are used, regardless of their effectiveness in laboratory studies. Mackowiak et al. (1994) reported that many volunteers who were willing to participate in their study changed their minds when they saw the devices to be tested. Those who did participate preferred the less complex devices, and the simple medication tray organizer was strongly preferred. However, even some of the simple medication organizers can prove difficult for older adults to use properly (Park et al., 1991) due to factors such as physical or cognitive decline (e.g., arthritis or low comprehension of medication regimens), especially for those taking multiple medications.

Past studies typically assign a memory aid and test it, but very few have examined older adults' real life use of memory strategies. If strategies are to be of any use, they must be used, and it would make sense to find out what strategies older adults are already using, and then to examine the role of these strategies in medication compliance. Older adults report that they are using memory strategies in every day life (Cavanaugh, Grady &

Perlmutter, 1983), however, few studies have closely examined these strategies. Those who have researched older adults' use of memory strategies outside of the laboratory have found that older adults use external strategies for everyday memory tasks such as remembering routines, objects or appointments (Cavanaugh et al., 1983; Gould et al., 1997; Loewen, Shaw, & Craik, 1990), and internal strategies for medication memory tasks (Gould et al., 1997). External strategies involve making a change to the physical environment such as placing the pill bottle on the breakfast table, while internal strategies involve mental efforts to remember, such as rehearsing medication instructions in your head or planning to take medications when you return from an errand (Dixon & Hultsch, 1983). Based on the reports of older adults regarding their differential use of memory strategies for everyday memory tasks versus medication compliance, Gould et al., (1997) feel that "It is possible that the type and quantity of strategies used are highly related to the targeted memory task." (p. 32).

Einstein and McDaniels (1996) believe retrospective and prospective components of memory to be distinct, and studies support that view through differential prediction of prospective and retrospective compliance (Devolder & Pressley, 1992; Gould et al., 1997; Loewen et al., 1990; Zelinski, Gilewski, & Anthony-Bergstone, 1990). More difficult time based prospective tasks may be changed into event based prospective tasks through the use of memory strategies (Maylor, 1990). In the Gould et al. (1997) study, older adults reported using both retrospective and prospective strategies for medication compliance. Strategies used regularly by over half of the sample included the external prospective strategy of leaving pills in a prominent place, internal prospective strategies

of relating pill taking time to usual activities, planning (in the morning) the medication regimen around the activities of the day, internal retrospective strategies of re-reading instructions to increase recall, re-reading very slowly, mentally repeating instructions, concentrating hard on verbal instructions, trying hard to learn the amounts, and trying hard to learn the times.

It is clear that memory strategies are effective compensatory tools, and it is known that older adults report the use of a variety of strategies outside of the laboratory for medication compliance. However, it is also known that compliance with medication regimens remains low, and that older adults are at risk for the negative effects of noncompliance. There is a piece missing - why is low compliance such a widespread problem when studies show that older adults report the use of effective memory strategies? It is interesting that older adults often don't continue to use memory strategies learned in a laboratory situation despite the fact that they are demonstrated to be effective aids. Obviously, factors other than objective improvement in cognitive performance are operating when older adults choose to use or to not use memory strategies for medication compliance. It would be helpful to know under what conditions older adults decide to use strategies to aid their compliance. In a recent study, Gould et al. (1997) used multiple regression to predict the use of strategies from a variety of variables, and reported that metamemorial factors predicted not only the use of strategies but also self-reported medication compliance.

The Metacognitive Component of Compliance

It is important to consider the role of metamemory in medication compliance for

two reasons. First, if medication compliance has a weighty cognitive component as described earlier, then it is important to examine metacognitive factors as metamemory is believed not only to reflect past cognitive performance, but also to affect future cognitive performance (Dixon & Hultsch, 1983a; Gould et al., 1997; McDonald-Miszczak et al., 1999). This means that metamemory may impact the cognitive performance of older adults for the prospective task of medication compliance. Second, metamemorial factors may influence an individual's choice to use or to not use effective strategies (Mazzoni, Cornoldi, Tomat, & Vecchi, 1997) as a compensatory aid for the task of medication compliance (Gould et al., 1997). Understanding the role of metamemory in the choice of strategies may help to clarify more about the complex task of medication compliance.

Metamemory is not memory, rather it is *about* memory; it has been very generally defined as "cognitions about memory" or "thinking about remembering" (Hertzog, Dixon, & Hultsch, 1990a; Hultsch et al., 1988). More specifically, metamemory can be defined as one's knowledge, affect, and beliefs about their own memory and about human memory systems (Dixon, 1989). Like compliance, metamemory is complex and metamemory is best considered a "multidimensional construct" (Dixon & Hultsch, 1983b; Hultsch et al., 1988). Metamemory consists of many different theoretical dimensions including 1) knowledge of basic human memory processes, 2) the perception of one's personal motivation to achieve a memory task, 3) the knowledge and self-reported use of memory strategies, 4) beliefs about one's own memory capacities, 5) perceived change in personal memory function, 6) locus of control regarding memory skills, 7) and anxiety regarding personal memory performance (Dixon & Hultsch, 1983a;

1983b; Dixon, Hultsch, & Hertzog, 1988; Hertzog, Hultsch, & Dixon, 1989). These dimensions are distinct, and each of these dimensions has demonstrated some degree of correlation with memory performance measures; correlations are generally only modest which is not surprising given the multidimensional nature of the construct (Dixon, 1989; Shlechter, Herrmann, & Toglia, 1990). Metamemory can be effectively conceptualized as having two broad dimensions including a knowledge base (factual memory and self-knowledge regarding memory) and a belief base (memory self-efficacy and memory related affect; Hultsch et al., 1988).

Metacognitive models describe the way in which metacognitive factors influence cognitive performance, and these models can be very simple or very complex. For example, Cavanaugh (1989) presents a complex metacognitive model which in part predicts that metacognitive beliefs impact performance through outcome expectation, effort and strategy selection. A less complex model would predict that self-efficacy (which is influenced by past performance) impacts future performance through strategy use. In each model, metacognitive beliefs influence cognitive performance through the use of strategies. There are no metacognitive models however, which deal specifically with the task of medication compliance.

It is important to note that medication compliance is not strictly a measure of cognitive performance, but it is also a health behaviour. Indeed, Park et al., (1994) suggest that as compliance becomes more understood, more sophisticated models of health behaviour should evolve. The Health Belief Model (Rosenstock, 1974) is a comprehensive model developed to examine the role of individuals' beliefs in

preventative health behaviour, yet it is not readily adaptable to medication compliance (Kasl, 1974). Older adults' medication is usually prescribed for diagnosed chronic conditions, and therefore such compliance is not considered to be preventative health behaviour. Despite this limitation, the Health Belief Model does provide a framework and history of research with extensive support for the importance of beliefs in health behaviours (Rosenstock, 1990). The key components of the health belief model include the individual's perception of threat (of personal susceptibility to an illness and of severity of the illness), one's outcome expectations (perceived benefits of action less perceived barriers to that action), and self-efficacy regarding one's ability to carry out the action necessary to avoid the illness (Rosentstock, 1990). Although the focus of this paper is on the cognitive and metacogntive components of compliance, it is important to remember that medication compliance is neither strictly cognitive performance, nor is it strictly a health behaviour, rather it is a hybrid between the two. Moreover both the metacognitive models and the health belief model provide evidence that beliefs are an important component of both aspects of compliance.

Certainly, the Health Belief Model has been tested over many years with a wide variety of health behaviours including medication compliance (e.g., antipsychotic medication; Budd, Hughes, & Smith, 1996), compliance with weight loss or exercise regimens (Becker, Maiman, Kirscht, Haefner, Drachman, & Taylor, 1979), preventative diet, exercise, and smoking behaviour, attendance to various screening programs, as well as breast-self-examinations - and beliefs have proven to be an important factor in individuals' health behaviours (for a review see Becker, 1974; Janz & Becker, 1984)

though this relationship is not always found (Becker et al., 1979). Further, in keeping with the metacognitive models, medication compliance and other forms of memory performance and adaptive memory behaviours have been shown to be affected by many metacognitive factors such as motivation to comply (Janz & Becker, 1984), commitment (Putnam, Finney, Barkley, & Bonner, 1994), the belief that compliance is important (Gould et al., 1997; Lorenc & Branthwaite, 1993), concern about health matters in general, fear of medication addiction (Lorenc & Branthwaite, 1993), the perceived seriousness of memory failure or memory problems (Dobbs & Rule, 1987; Zelinski, Gilewski, & Anthony-Bergstone, 1990), general attitudes about beliefs and memory such as memory anxiety (Gould et al., 1997) and memory self-efficacy (Gould et al., 1997; McDonald-Miszczak et al., 1994; Zelinski et al., 1990), and attributions of control (Devolder & Pressley, 1992; McDonald-Miszczak et al., 1999; Robinson-Whelen & Storandt, 1992). Further, metacognitive variables can also influence compliance indirectly through other metacognitive variables such as when "motivation...*[which affects performance]*..is influenced by beliefs about the value of the treatment and about one's ability to perform the task (Janz & Becker, 1984)" (cited in Park et al., 1994, p. 41). Similarly, Mueller, Johnson, Dandoy and Keller (1992) reported that the self concept can serve as a mneumonic aid to memory performance.

Metamemorial beliefs are relatively stable over time despite changes in actual memory performance (McDonald-Miszczak, Hertzog, & Hultsch, 1995). However, direct intervention with metamemory can improve older adults' beliefs that they can control their memory change and that ability can improve with effort, and such

intervention can contribute to more positive beliefs regarding current memory abilities (Lachman, Weaver, Bandura, Elliott, & Lewkowicz, 1992). This is important in light of the fact that metamemorial beliefs can impact future memory performance.

Just as it was necessary to examine how older adults perform cognitively to understand the task of compliance for older adults, it is also important to examine the metamemorial knowledge and beliefs of older adults in order to understand the role of metamemory in compliance for this population. The patterns of metamemory are different for older adults than for younger adults, and so the relationship of older adults' metamemory to actual memory performance may also be unique. For example, McDonald-Miszczak, Hertzog and Hultsch (1995) reported that as memory performance declined in older adults, Memory Self Efficacy (MSE) decreased while memory anxiety and external strategy use increased.

Older adults report more memory problems than young adults (Dobbs & Rule, 1987), are more likely to use external memory aids (Hultsch, Hertzog, & Dixon, 1987; Loewen et al., 1990), are more likely to be upset by memory failure (Cavanaugh et al., 1983), report lower memory capacity (beliefs about memory ability) (Hultsch et al., 1987; Loewen et al., 1990), more decline in memory function, and a more external locus of control. Yet those older adults who believe memory performance to be due to controllable factors demonstrate better memory performance (Devolder & Pressley, 1992). Older adults have reported that it is more important to remember the amount than the time to take a medication, and that side effect information is just as important as either amount or time (Gould et al., 1997). Compared to younger adults, older adults tend

to be more accurate in predicting their own memory performance (Hertzog, Dixon, & Hultsch, 1990; McDonald-Miszczak et al., 1994), and are more likely to improve their prediction accuracy with experience (McDonald-Miszczak, Hubley, & Hultsch, 1996). Older adults' MSE guides performance predictions until task specific experience is gained, and then this task specific experience guides predictions of memory performance (Hertzog, Dixon, & Hultsch, 1990b; McDonald-Miszczak et al., 1994). Hertzog, Dixon, & Hultsch, (1990b) suggest that their results support the hypothesis that MSE beliefs are partially based on actual memory performance, and that age differences in memory predictions may be mediated by differences in MSE. Older adults' performance may be more related to their beliefs about MSE than younger adults (Hultsch et al., 1988). This makes metacognition an important issue to consider when examining medication compliance in older adults.

Unfortunately, older adults' metacogntive beliefs are quite often negative, and these beliefs can impact their memory performance, including their medication compliance. Fortunately, these beliefs can be improved with intervention (Lachman et al., 1992). Since beliefs have been shown to impact both cognitive performance and health behaviours, and since medication compliance is a hybrid of a health behaviour and of cognitive performance, it is apparent that medication compliance may be susceptible to the influence of an individual's beliefs. The success of the health belief model in predicting health behaviours and the evidence supporting metacognitive models suggest that it is time for a metacognitive model that deals specifically with the health behaviour of medication compliance. This will open the door for an intervention paradigm focused

on older adults' metacogntive beliefs, and it may prove to be an effective tool for aiding older adults in their medication compliance.

Measuring Compliance

Compliance cannot be studied without first being measured, and the method of measurement chosen affects any conclusions that can be drawn about compliance. A compliance measure should be one that can be compared to past research, and one that is appropriate to the particular goals of the individual investigation (Sackett, 1979). Recently, Cramer and Rosenheck (1998) reviewed over 20 years of research in order to compare compliance rates between physical and mental disorders. Compliance with medications for physical disorders was measured using microelectronic monitoring with a mean compliance rate of 76% (SD=10; with means ranging from 60-92%). Compliance with antidepressant and antipsychotic medications was measured using a variety of methods including clinician's judgement (M=72%; SD=20, range 33-90%), a combination of either pill counts or blood levels along with self-report (M=63%; SD=18%, range 40-90%), urine tests (M=60%; SD=18, range 35-88%), and patient self-report (M=52%; SD=17%; range 24 - 87%). Two meta-analyses (Goodwin & Jamison, 1990; Montgomery et al., 1995) revealed compliance rates of 66% and 79% respectively. Considering all measures of compliance together, the overall rate of compliance with antipsychotic medications was 58%. Unfortunately, they did not extend their research to cover similar methods of compliance measurement in physical disorders, nor could they find compliance research using microelectronic monitoring for mental disorders. However, their research does provide an overview of a wide range of compliance rates

found with a variety of measurement methods, and highlights the importance of careful consideration when choosing a method of measurement.

There are many ways to measure medication compliance and these methods differ in terms of accuracy, accessibility, cost, and ecological validity. Measures of compliance can be either direct or indirect (Boczowski & Zeichner, 1985). Direct measures of compliance assess drug levels in the body, while indirect methods do not confirm whether or not drugs have actually been ingested. This category of measurement includes a variety of measures such as checking on prescription refills, pill counts, measurement of therapeutic effect, clinician judgement, bar code technology, MEMS (a medication event monitoring system), and patient self-reports. Some indirect methods (such as MEMS) are highly accurate but are very costly and inaccessible, therefore such methods of measurement are often restricted to research situations and have very little ecological validity. At the other extreme are measures (such as the self-report) that are inexpensive, very accessible, and high in ecological validity, but often inaccurate. Each method of measurement carries with it some drawbacks, and it is important to consider these drawbacks when choosing a method of measuring compliance.

Direct Measures of Compliance

Biologic assays of active drug or metabolite (e.g., biological markers in urine or blood levels) are often very costly and usually not very practical for the purposes of most compliance studies (Babiker, Cooke, & Gillett, 1989). Drug assays can be affected by factors other than compliance, such as the presence of other medications, individual differences in metabolism of drugs, and long-lasting and possibly cumulative effects of

other drugs. Further, these drug assays are measures of compliance at only one particular point in time (Babiker et al., 1989; Dubbert et al., 1985; Rudd, 1993), and this one instance may not be (in fact is unlikely to be) representative of an individual's overall compliance with their medication regimen. When drug assays are used, compliance may be more likely because the individual knows they will be seeing their doctor and this serves as a memory cue for them to take their medication. Further, if an individual knows s/he will be tested, s/he may be motivated to comply previous to the appointment so that s/he will appear compliant in general. Because these methods are not readily available, are not necessarily accurate, and reflect atypical instances of compliance, other methods of compliance measurement have been examined.

One alternate method of measuring compliance is through the detection of a tracer, or an alternate substance added to a medication or ingested along with a medication. As far back as 1959 Hobby and Deuschle reported riboflavin to be an ideal tracer, and although there are other tracers available, riboflavin has received much attention in the literature. Hobby and Deuschle considered riboflavin to be "safe, nontoxic, nonallergenic, cheap, palatable, stable under normal conditions, readily absorbed when taken orally, readily excreted in the urine, and easily detected at a low concentration." Riboflavin shows up in the urine as a flourescent yellow, and various amounts (as low as 25 mg) are easily detected from two to eight hours post ingestion with a high degree of accuracy by inexperienced observers using a matching to sample method which requires very little equipment (Dubbert et al., 1985). This makes the riboflavin method accessible and quite accurate under certain conditions, and therefore it is an

important method to consider for compliance measurement.

Babiker et al., (1989) conducted a series of experiments using riboflavin and reported that although the use of riboflavin as a tracer is very effective for single 50-mg doses, more frequent doses render riboflavin an unreliable tracer. They attribute this to a "spillover" effect due to incomplete elimination of previous doses of riboflavin by the time the next dose is to be measured. This is important because many older adults require their medications two and three times per day rather than one time per day. In Babiker et al.'s (1989) study, when doses were taken two and three times daily, pre-dose urine samples contained levels of riboflavin that were so high they could not be distinguished from post-dose levels. Because a tracer method like this is a measure of only one instance of compliance, reliability is extremely important.

Although tracing as a measure of compliance can be very accurate in laboratory situations involving relatively large, single doses of riboflavin, this method of measuring compliance in the real world or in long term studies is not feasible. Older adults often take more than one dose of multiple medications in a single day, so using a tracer for each medication would be unrealistic, and would provide unreliable measures of compliance. Direct measures of compliance examine only a discreet instance rather than a pattern of compliance, and even when they are highly accurate, they reveal very little about an individual's compliance with medication instructions. When looking at the issue of compliance in older adults, as is the case with many health related behaviours, any single instance of a health behaviour such as compliance is of little importance when compared to the patterns of behaviour over time. Direct measures of compliance are not able to

assess patterns of behaviour, and may reflect unusual instances of compliance, therefore indirect methods of measurement must also be considered.

Indirect Measures of Compliance

Checking on prescription refills can be used to measure compliance, however people don't always fill their prescription at the same pharmacy; many people use more than one pharmacy because of convenience of location or cost. Also, those who have medication coverage may be more likely to fill prescriptions they won't use than those who must pay for their medications out-of-pocket. Further, when checking on prescription refills it is not known whether or not a person actually ingested their medication, only that the prescription was filled. Prescription refills are, therefore, not an accurate reflection of actual compliance. This method of compliance measurement would require keeping track of each pharmacy that a person uses, and this would often rely on self-report of pharmacy use. Since this method relies on self-report of pharmacy use, and because once the pharmacies are located there is no way of knowing whether or not the medications are ever ingested when a prescription is filled, it would make more sense to use patient self-report to measure compliance directly. This method of measurement may be useful however, in situations where older adults live in a home with an in-house pharmacy.

Pill counts are a little more ecologically valid because a physician is more likely to conduct a pill count than to research their patients' use of pharmacies. However, pill counts are often inaccurate and they can be labour intensive if they are conducted in the patients home. Pill counts can be conducted in the physicians office, yet these pill counts

are usually anticipated by the patient, and this factor can change patterns of compliance prior to the appointment as when using direct measures of compliance, and this will result in less accurate measures of compliance. Patients may count out the correct number of pills and dump the rest so that they appear compliant. "Further, pillcounts must assume uniform pill-taking between assessments; therefore, this method also relies on self-reports." (Lipton & Bird, 1994).

Therapeutic effect of the medication may also be used to measure compliance, and this method is more ecologically valid than both checking on prescription refills and pill counts because physicians frequently use this information to determine not only compliance with medication but also the effectiveness of a prescribed medication. However, using the therapeutic effect of a medication to measure compliance is problematic not only because therapeutic results may occur without full compliance, but also because therapeutic effect itself needs to be monitored in patients independently of compliance. It may be that an individual doesn't need their full prescription, but using therapeutic effect as a tool to measure both medication effectiveness and compliance will mask the fact that less medication is needed. This won't be discovered because therapeutic effects are achieved and the prescription is continued at the current level.

In such a scenario, it is tempting to assume that clinicians know their patients well enough to correctly estimate their compliance with prescribed regimens. If this were the case, then physicians could use their judgement to determine whether or not a patient is complying to their medications, and then use therapeutic effect to determine the effectiveness of this compliance. Unfortunately, a physicians guess is only as good as

anybody else's when it comes to determining levels of compliance in other people (Gordis, 1979). Hence another ecologically valid measure of compliance is needed, and such a measure will be discussed after consideration of what technology can contribute to the measurement of medication compliance.

Technology and compliance measurement. Technology has provided indirect methods of measuring compliance that can be quite accurate, however these methods can also be quite intrusive or expensive (Park et al., 1994). Bar code technology has provided such a measure that is quite accurate, yet very intrusive to the patient. Further, bar code systems such as The Videx Time Wand System are not ecologically valid measures because they are generally used only in research situations, and not in actual compliance situations outside the laboratory. Indeed, this method of measuring compliance changes the task of compliance with medication to a task of compliance with medications plus compliance with the compliance measure. This method requires the patient to scan a bar code corresponding to the correct medication every time a medication is taken. The Videx Time Wand System uses a credit card sized scanner and electronic bar code card technology. Bar codes are given to subjects for each of their medications, and these are put into a wallet. The Wands need to be recharged every week, but the only cost is the initial purchase of the wand and the downloading software.

A simpler solution using technology to measure compliance is the Medication Event Monitoring System (MEMS). Rates of adherence appear to be similar across both types of technology, and they are both sensitive to interventions (Park et al., 1994). MEMS is an indirect method which involves placing a microchip in bottle caps, and the

date and time is automatically recorded each time the cap is opened. MEMS is not obtrusive to the patient in any way, and the batteries need not be replaced for months. MEMS pin points the date and time accurately every single time a bottle of medication is opened.

MEMS can be considered the gold standard regarding accurate measurement of compliance with medications. Yet even with this status, there are drawbacks to the MEMS method of measurement. First, there is no way of measuring how many pills are taken out of the medication bottle each time, and older adults often take multiple doses of a medication at one time. Although it is known wether or not medication was taken at the correct time, it is not known wether or not the correct dose was ingested. Another very important drawback is that MEMS does not allow for certain types of strategy use which are useful in aiding older adults in the complex task of compliance. Research has shown that older adults perform better when they are able to use strategies such as counting pills, using organizer trays, and taking the pills out ahead of time and placing them in a prominent place. A measure of compliance, no matter how accurate, is not useful if it interferes with the task of compliance in anyway. Finally, a third drawback to using MEMS to measure compliance is the prohibitive cost. A recharge is needed every five months, and they carry a very costly monthly rental charge (Park et al., 1994). As a result, MEMS is not accessible and cannot be used except in high budget research programs. The cost limits MEMS to the role of an elite laboratory research tool, and keeps the tool out of the hands of physicians who assess real life compliance and act on these assessments every day.

Even with the contributions technology has made to the measurement of compliance, efficient measurement continues to be elusive. A measure of compliance needs to be assessable, ecologically valid, and feasible for use where such measures are needed frequently. To find such a measure, it would be wise to turn to the place where compliance information is gathered and used on a daily basis: the physicians office. Clinicians frequently use patients' self-reports of compliance to measure compliance and alter regimens. However, the relationship between oft' used self-reported compliance and MEMS (the gold standard for accurate measurement of compliance) is very inconsistent.

Self-reports of compliance. Why would such a commonly used measure have such an inconsistent relationship with the gold standard of compliance measurement? Self-reports of compliance have been defined as domain specific metamemorial judgements (Gould et al., 1997), and the self-report is a complex mixture of beliefs and objective factors (McDonald-Miszczak et al., 1999). Thus, while MEMS measures compliance alone, the self-report is not only a measure of compliance, but also a metamemorial judgement. Perhaps the complexity of the self-report contributes to this inconsistent relationship, as self-reported compliance is a more dynamic measure than MEMS. Compliance itself is neither simple nor straightforward, and the self-report reflects this fact.

Laboratory tasks have been found not to be correlated to self-reports of memory (Sunderland, Harris, & Baddeley, 1983), however self-reports have been related to everyday intelligence (Cornelius, 1990), and self-reports of compliance at 6 months and 42 months predicted controlled blood pressure at both 2 years and 5 years (Morisky,

Green & Levine, 1986). Gould and her colleagues (1997) proposed that self-reports of compliance are a potential source of significant practical and theoretical value, over and above their objective accuracy as measures of compliance. Further, self-reports are the foremost means of data collection currently used in the social sciences (Cavanaugh, 1999).

Despite this, self-reports of compliance tend to be overestimated (Graveley & Oseasohn, 1991; Isaac et al., 1993; Putnam et al., 1994; Rudd, 1993) and are often considered problematic measures of compliance (Park & Kidder, 1996). However, those self-reports which describe an individual as noncompliant are reliable (Gordis, 1979), and this quick and simple method can help to positively identify a set of older adults who would be most likely to benefit from effective intervention. In fact, people who identify themselves as noncompliant may be more likely to benefit from interventions than those noncompliant individuals who do not identify themselves as noncompliant (Gordis, 1979; Rudd, 1993). Using the self-report can quickly identify a subset of noncompliant individuals with minimal use of resources for measurement, and can ensure that interventions are targeted to a population where they will be most effective. This can free up resources to pursue other means of assessing and aiding noncompliant older adults who do not identify themselves through self-reports.

Unlike biologic assays, self-reports of compliance are not restricted to measuring a discreet event, rather they can be used to measure a pattern of compliance over time. And it is the long term pattern of compliance that is important, rather than the discreet event, as is the case with many health behaviours (Gordis, 1979; Rudd, 1993).

Further, the self-report has certain advantages when compared to checking on prescription refills. Checking on whether or not a prescription has been filled relies on the patient's self-report of pharmacy use, and it does not give any information about actual ingestion of medications. When checking on prescription refills, all that is known is that the medication has been purchased. This method relies on self-reports to obtain only partial information, while self-reports of medication compliance have the advantage of targeting the ingestion of medications, and not just whether or not a medication has been obtained.

Surprise pill counts can be a relatively accurate measure of compliance, however most pill counts are anticipated. Surprise pill counts are time consuming and therefore costly when conducted in the patients' home, yet when patients are asked to bring their medications into the physician's office for a "brown bag" visit, the patient knows that their compliance will be assessed. This knowledge often motivates patients to alter the contents of their medication bottles to reflect better compliance than has actually occurred. In a sense, the pill count in the physician's office becomes a self-report yet is incorrectly considered a more objective measure of compliance.

While the use of the Videx Time Wand System or MEMS to measure medication compliance would likely give the most accurate measures of compliance, they too have drawbacks (such as prohibitive cost and patient intrusiveness) that render them inappropriate for use in the "real world" to measure compliance. Self-reports have been used as long as medication has been prescribed, and despite advances in technology they continue to be one of the most common means of assessing medication compliance by

physicians today.

Self-reports are often the most practical means of measuring compliance due to time and cost restrictions, and are routinely used as a compliance measure outside of the laboratory. Self-reported compliance is the most ecologically valid compliance measure available: doctors do not prescribe MEMS caps, they do not take biologic assays to check on compliance in most cases, and they only occasionally conduct pill counts. However, it is routine for physicians to ask their patients to give a self-report of their medication compliance, and self-reports are also used by older adults to monitor and maintain compliance with their complex medication regimens. For example, if an older adult believes that she has already taken her medication, she will not take it "again." If this belief was inaccurate, then the older adult has mistakenly been noncompliant with prescribed medication as the result of a self-report of compliance. Many important decisions are based on self-reports of compliance, therefore it is important to gain an understanding of this frequently used measure of older adults' compliance in order to increase it's effectiveness as a compliance measure.

Like every other method of measuring compliance the self-report has drawbacks, the primary drawback being lack of absolute accuracy. Improving the accuracy of an ecologically valid measure such as the self-report would seem to be an important alternative to settling on any of the presently available measures of compliance. Attempting to increase the ecological validity of a more accurate measure such as MEMS or bar code technology is another option worthy of research, but the cost remains prohibitive for many laboratories and the measures are either overly intrusive or

inaccessible at this time. Consequently, it would be wise to increase the accuracy of an inexpensive, accessible, unintrusive and ecologically valid measure that is routinely used by physicians, pharmacists and older adults. Hence, one of the goals of this study was to increase the objectivity of the self-report through more focused questioning.

Our attempt to increase the accuracy of self-reported compliance can best be understood by examining the meaning of accuracy with respect to self-reported health measures. Perceived health does not accurately measure an individual's health, but it reflects some of the objective aspects of health and these self-reports are often used to indicate health (Greiner, Snowdon, & Greiner, 1996; McCrae, Bartone, & Costa, 1976; Wenglert & Rosen, 1995). If a self-rating of health is correlated with objective factors, then the rating is considered to be more reflective of actual health, or is considered to be more accurate. In the same way, self-reports of medication compliance may not accurately measure one's compliance, but if self-reports reflect the objective components of compliance, then they may be considered to more accurately reflect compliance. Therefore for the purposes of this study accuracy will be defined as a reflection of objective factors.

Focused questioning may decrease some of the complexity that leads to inaccuracy in self-reports of compliance by focusing the patient on the objective components of compliance for each medication separately. Indeed, recall tasks are often simpler when they are broken down (Cavanaugh, 1999). As a result, self-reported compliance measured in a more focused manner by asking more specific questions may reflect more of the objective aspects of compliance, and self-reports could therefore be

considered more accurate. In order to facilitate more objective self-reports of compliance, the questions used to measure compliance should be aimed at the important objective components of the compliance task rather than subjective judgements.

Self-reports of compliance have been used in numerous studies throughout the compliance literature, and these measures have been comprised of one or two question interviews (Becker et al., 1979; Col et al., 1990; Opdycke et al., 1992; Ostrom, Hammarlund, Christensen, Plein, & Kethley, 1985), four or five question instruments (Gould et al., 1997; Lipton & Bird, 1994; Morisky, Green, & Levine, 1986), and multiple question comprehensive medication assessments (Pesznecker, Patsdaughter, Moody, & Albert, 1990). The use of such a variety of self-report measures makes it difficult to draw firm conclusions from the literature. Additionally, many studies do not even indicate the nature or number of self-report items used to measure compliance in their research (Bernstein et al., 1989; Conn et al., 1991; Graveley & Oseasohn, 1991; Isaac et al., 1993; Putnam et al., 1994; Valenstein, Barry, Blow, Copeland, & Ullman, 1998). Some of these studies have measured compliance with medications in general (Becker et al., 1979; Gould et al., 1997; Morisky, Green, & Levine, 1986; Opdycke et al., 1992), and others have inquired about each medication separately (Darnell et al., 1986; Lipton & Bird, 1994; Ostrom, Hammarlund, Christensen, Plein, & Kethley, 1985).

Although there are a number of measures of self-reported compliance, many of these measures are flawed. Single question measures are not very reliable, and multiple question inventories are not very practical for everyday use in a busy physicians office or pharmacy. Further, older adults are not likely to sit down and administer themselves a

large questionnaire to improve their compliance, but they are more likely to focus on a few important aspects of their compliance and update themselves on their performance. A good self-report measure of compliance would focus on a few important, objective aspects of compliance (Gould et al., 1997; Morrow, Leirer, Altieri, & Tanke, 1991), and consider each medication separately as individuals may have different levels of compliance with different medications for a variety of reasons (Rudd, 1993). Lipton & Bird (1994) approached self-reported compliance measurement in this manner and found that their self-report instrument was sensitive to intervention effects. Gould et al. (1997) developed a medication questionnaire which focused on the important aspects of compliance (Morrow et al., 1991), however they did not consider each medication separately, and compliance was predicted by subjective rather than objective factors. Perhaps the use of this questionnaire in a more focused manner would yield different results, tying self-reported compliance to more objective factors, and therefore presenting a more "accurate" picture of compliance.

Chapter Two: The Present Study

The Present Study

The purpose of the present study is threefold. First, the study will attempt to replicate Gould et al.'s (1997) research on older adults' use of memory strategies to aid medication compliance. Second, the present research will extend the research of Gould et al. (1997) by examining a number of different factors ranging from objective assessments of health to belief laden assessments of one's memory ability. These factors will be investigated for ability to predict compliance using a more focused version of the Gould et al. (1997) self-report measure. Finally, a metacognitive model of self-reported compliance will be tested.

Description and Prediction of Strategy Use

It is important to understand strategy use in order to learn more about medication compliance in older adults. Medication compliance has been described as a complex task which makes heavy demands on one's memory (Einstein & McDaniel, 1996; Gould et al., 1997; Park, 1992; Park et al., 1992; Park et al., 1994), and memory strategies are often used by older adults to aid them in this task (Cavanaugh et al., 1983; Gould et al., 1997). The use of strategies by older adults has proven to be an effective tool for memory tasks including the task of medication compliance (Devolder & Presley, 1992; Einstein & McDaniel; 1990; Leirer et al., 1988; Leirer, Morrow, Tanke et al., 1991; Maylor, 1990; Park et al., 1994; Stigsdotter & Backman, 1989; West 1988).

The present study attempts to replicate Gould and her colleagues' (1997) investigation of the strategies that older adults use for medication compliance. The primary goal of Gould et al.'s (1997) study was to investigate older adults' use of

memory strategies for their medications. A second goal was to identify factors that predicted the use of memory strategies and self-reported compliance. The predictors used for these analyses included a variety of metamemorial factors as well as medication and medical factors.

Gould et al. (1997) used multiple regression to analyze data from fifty one adults over the age of 65 who were taking at least one prescription medication. The package completed by these adults included a personal information questionnaire, a medication questionnaire to measure self-reported compliance and the perceived importance of compliance, Prospective Memory for Medication Questionnaire (PMMQ), the Metamemory in Adulthood Questionnaire (MIA), and the Center for Epidemiologic Studies Depression Scale (CES-D). Pharmacists' ratings of the seriousness and discomfort for participants' medical conditions were also obtained for each medication. Self-reported compliance was a general measure in this study, and asked each of the five compliance and importance of compliance questions only once.

Gould et al. (1997) found that older adults reported using internal strategies as memory aids for medication taking, but external strategies for everyday events. The authors also found that neither medication variables nor strategy use variables significantly predicted self-reported compliance; however, metamemorial variables (memory self-efficacy and memory anxiety) did significantly predict both self-reported compliance and the use of memory strategies to aid compliance. Further, the importance older adults placed on compliance also predicted the use of memory strategies. The authors concluded that with respect to medication compliance older adults rely, to a great

extent, on general beliefs regarding memory rather than on more objective health factors when they choose to use memory strategies, and that this seems to be mediated by the importance older adults place on adherence (Gould et al., 1997).

Like the Gould et al. (1997) study, the present investigation uses the Prospective Memory for Medication Questionnaire (PMMQ) to measure older adults' use of strategies to aid compliance. In addition, many of the same predictor variables (i.e., medical variables, importance of compliance, and memory belief variables) that were used in the Gould study will also be used to predict strategy use in the present study. However, the present study includes an additional measure (memory ability) that was overlooked in the previous work. The memory tasks in the present study were chosen to represent memory abilities relevant to medication taking, and these tasks will be described in detail in the method section of this paper. The addition of a memory performance variable may reveal important information about older adults' use of memory strategies for medication compliance. As demonstrated in the Gould et al. research, older adults' decisions to use strategies as a memory aid for the cognitive task of medication compliance may be based on belief related factors, such as beliefs about memory ability. However, such decisions may also be based on more objective factors such as actual memory ability. The inclusion of both objective and subjective factors as possible predictors of strategy use will allow us to learn more about what motivates older adults to use strategies for medication compliance.

Given the range of predictor variables included in the present study, two possible outcomes were proposed. The first outcome would be a replication of the Gould et al.

(1997) study in which two belief laden variables, the perceived importance of compliance and memory beliefs, predict strategy use. This would suggest that older adults base their decision to use strategies on subjective belief related factors (Gould et al., 1997; Lorenc & Branthwaite, 1993). For example, an older adult may choose to use memory strategies because they believe that they have a poor memory, or because they believe that they will not be able to remember a specific memory task, such as compliance, without the help of strategies. Further, if an individual believes that compliance with a particular medication is important to her health or quality of life, she may be more likely to use memory strategies to ensure that the important task is not forgotten.

Because research has demonstrated a relationship between strategy use and memory performance (Lachman, Weaver, Bandura, Elliott, & Lewkowicz, 1992; Leirer, Alteri, & Tanke, 1991; Leirer et al., 1988; Leirer, Morrow, Tanke et al., 1991; Lorenc & Branthwaite, 1993; Machowiak et al., 1994; Park et al., 1991; Park et al., 1992; Park et al., 1990; Stigsdotter, & Backman, 1989), the second possible scenario was that strategy use would be predicted by actual memory performance. This scenario would suggest that older adults base their decisions to use strategies on objective factors such as their actual memory ability. Perhaps those with poorer memories use more strategies in order to compensate for deficient abilities.

Self-reported Compliance: Accuracy and Prediction

The primary goal of the present study is to evaluate self-reported compliance. Self-reports of compliance are used everyday by physicians and older adults alike. This information is part of the foundation for decisions about changes in regimens and for

compliance behaviours. Self-reported compliance has been described as a "domain specific metamemorial judgement" or "an estimate of one's memory ability within the particular domain of medication taking" (Gould et al., 1997, p.11). However, it may be possible that more accurate self-reports of compliance reflect more than metacognitive factors. For example, when older adults are encouraged to consider their compliance for each medication separately, rather than provide a global assessment that generalizes across all their medications, it may be found that such focused assessments are more accurate (driven by objective health factors) than the global assessments.

In replication of the Gould et al. (1997) study, the present study uses a measure of compliance representing five important components of medication compliance (Morrow et al., 1991). However, in the Gould et al. (1997) investigation participants were asked to report their compliance with all of their medications at once while participants in the present study reported their compliance with each of their medications separately. Because focused questioning results in more accurate patient recall (Rost & Roter, 1987), this more specific method of questioning is expected to result in more accurate information regarding past compliance.

If self-reports reflect compliance objectively using this more focused method of questioning, then medical or cognitive variables are expected to contribute to the prediction of self-reported compliance. However, if self-reported compliance is not tied to more objective health indicators, then subjective belief related variables are expected to predict perceived compliance as in the Gould et al. (1997) study.

Self-reported Compliance: A Path Model

As described earlier, self-reported compliance is not only a metacognitive assessment but also a health behaviour, and despite much work with metacognitive models and much investigation of the role of health beliefs in predicting health behaviours, there are currently no metacognitive models that deal specifically with the health behaviour of medication compliance. The present study seeks to investigate such a metacognitive model in order to understand both the actual compliance task and self-reports of compliance.

It is logical that the importance that older adults place on the task of compliance should predict their compliance, indeed this is supported by the correlation reported in the Gould et al. (1997) study. However, if self-reported compliance does reflect actual compliance (at least to some degree), it is expected that beliefs about the importance of compliance will drive compliance behaviours such as strategy use. In fact, Gould et al. (1997) reported a significant relationship between the importance of compliance and four types of strategy use. Further, many studies have demonstrated significantly better compliance when strategies were employed (Coe, Prendergast & Psalhas, 1984; Park et al., 1991).

Thus the present study seeks to examine a path model whereby the importance of compliance predicts compliance through the use of memory strategies as described in the PMMQ. Further, the importance of compliance is expected to predict compliance differentially through retrospective versus prospective strategy use because compliance errors are more likely to be prospective than retrospective (Bernstein et al., 1989; Col et

al., 1990; Park et al.,, 1992; Swonger & Burbank, 1995) and because of the distinction between prospective and retrospective components of memory (Devolder & Pressley, 1992; Einstein & McDaniels, 1996; Gould et al., 1997; Zelinski et al., 1990).

Chapter Three: Method

Method

Participants

A total of 61 older adults recruited from local seniors' groups and from the general community volunteered to participate in this study. Nine were rejected from the sample because they had more than two missing data points on key scales, and two were rejected because they required visual assistance in completing the questionnaires. However, 14 of the remaining 50 individuals had only one or two missing data points on multiple item scales and were excluded from analyses involving those data points. The missing data points were random as determined by the use of dummy variables (Tabachnick & Fidell, 1996), and in all analyses there were at least 47 cases available, although there were usually 49 cases available for analyses in the event of missing data.

The remaining 50 participants ranged in age from 51 to 83 years with a mean of 70.1 years, which is 5.8 years lower than the mean age in the Gould et al. (1997) research. The current research had 20 male and 30 female participants, which is very similar to the Gould et al. (1997) study which had 19 male and 32 female volunteers. In the present study, 30 participants (60%) were married, 14 (28%) were widowed, 4 (8%) were divorced, 1 (4%) was living common-law, and 1 (4%) was single. Seventeen (34%) of the older adults lived alone and 33 (66%) lived with someone else. Twenty-two percent of the participants had completed elementary school, 78% completed high school, and 36% completed at least one year of college. The Gould et al. (1997) sample had more participants with both high school (88%) and college (65%) education. The mean score obtained on the Center for Epidemiological Studies - Depression (CES-D) Scale (Radloff,

1977) was 11.61 (SD=6.72), only slightly higher than the mean score of 8.4 (SD=7.9) obtained by the Gould et al. (1997) sample. This scale is scored out of a maximum of 60 points with higher scores indicating higher levels of depression.

During the five years before the study, 86% of the sample had suffered from between one and four medical conditions (M=2.52, SD=1.54) with a range of one to six conditions. The participants were taking an average of 3.18 medications(SD=2.25), which is quite similar to the average of 3.14 medications (SD=1.98) taken by the participants in the Gould et al. (1997) sample. More specifically, 52% of the current study's volunteers were taking 1 or 2 medications (M=1.35, SD=.49), with a range of 1 to 14 medications. The mean for those participants taking 3 or more medications was 5.17 (SD=2.81). During the 12 months before the study, 24% of the sample had seen a doctor one time, and 50% had seen a doctor between two and five times. This too is similar to the average of two to five visits in the Gould sample. Also, 82% of participants had not stayed overnight in the hospital in the past year. At the time of the study, 80% of participants rated their health as "good" or "very good" compared to a perfect state of health, a slightly higher rating than the Gould sample, who were more likely to rate their health as "good."

Measures

Self-Reported Compliance

Compliance for each participant was measured with five questions for each medication being taken (see Appendix A). For example, a person taking three medications would answer the five questions for each medication (a total of 15

questions). Participants were asked to rate, on a five-point scale, how often they take each medication: a) exactly as prescribed, b) exactly at the time prescribed, c) exactly in the correct amount. Using the same scale, they were also asked to report how often they remember: d) the name of the medication and, e) information about side-effects and things to avoid while taking the medication. Previous research has shown that these five items are important components of medication compliance (Morrow, Leirer, Altieri & Tanke, 1991). For each of these questions, the participant could choose to respond with (1) over 90% of the time, (2) 75% to 90% of the time, (3) 50% to 75% of the time, (4) 25% to 50% of the time, or (5) less than 25% of the time. Self-reported compliance for each participant was defined as the average response across the five questions for all medications the participant was taking. The range of possible scores for self-reported compliance was from 5 to 25 where a high score reflects lower perceived compliance with medication regimens.

Importance of Compliance

Participants were asked to report if it was important to them to comply with their medication instructions for each medication (see Appendix A). It is crucial to inquire about patients' beliefs regarding the importance of compliance with their medications because these beliefs have been strongly correlated with compliance in past research (Gould et al., 1997), and because of the demonstrated importance of health beliefs in health behaviours (Rosenstock, 1990). For each of the five components of compliance listed above, the participant could choose a response regarding the importance of compliance from a five-point likert scale: (1) agree strongly, (2) agree, (3) undecided, (4),

disagree, and (5) disagree strongly. As in self reported compliance, the importance of compliance for each participant was defined as the average response across the five questions for all medications the participant was taking. For example, a person taking three medications would answer the five questions for each medication for a total of 15 questions. A person taking four medications would answer 20 questions in total. The range of possible scores for perceived importance of compliance was also 5 to 25, with a high score reflecting lower importance of compliance.

Medications and Medical Factors

Whether or not people take their medication correctly may depend, in part, on a number of medical factors. For example, regimen complexity (number of different pills per day and number of doses per medication) has often been demonstrated to contribute to noncompliance (Bernstein et al., 1989; Blackwell, 1973; Boczkowski & Zeichner, 1985; Botelho & Dudrak, 1992; Col et al., 1990; Conn et al., 1991; Darnell et al., 1986; Graveley & Oseasohn, 1991). Further, noncompliance is assumed to be more likely when the medication is prophylactic rather than treatment for a current serious condition, or when discontinuing treatment does not result in immediate consequences such as discomfort (Blackwell, 1973). Certainly, older adults who report higher ratings of seriousness for their symptoms also demonstrate more active involvement in coping behaviours such as medication compliance (Cameron, Leventhal & Leventhal, 1993). Because of the demonstrated correlation between compliance and these four medical factors, the number of medications being taken by each participant, the number of medical conditions, and the seriousness and discomfort scores for each condition being

treated were standardized separately, then summed to create a single standardized medical variable.

Number of medications and number of conditions. A medication questionnaire was administered for each medication a participant was taking at the time of the study. Each questionnaire requested the name of a medication and the condition being treated by the medication (see Appendix A). Participants were encouraged to bring a list of their medications to complete this portion of the study, although very few participants did. Subjects were also asked to record any conditions they had suffered from in the past five years (see Appendix P). The number of medications was summed as was the history of medical conditions reported. Participants were taking anywhere from 1 to14 medications at the time of the study, and reported suffering from zero to six conditions in the past 5 years.

Seriousness and discomfort. Two pharmacists were asked to rate the seriousness of each illness a participant reported suffering from and the level of discomfort associated with noncompliance (see Appendix B). Each medication was listed with the condition it was treating, and this list was given to two pharmacists who were blind to the purposes of the study. They provided independent ratings of the seriousness of each condition being treated, and the discomfort that would result from the condition if the medication was not taken for 1 to 2 days.

If life threatening complications would result from noncompliance, a high seriousness rating was given. A medium rating was given if long-term life threatening complications would result without treatment. Finally, a low seriousness rating was

given when failure to receive treatment would not necessarily lead to life threatening complications. Inter-rater reliability for seriousness ratings was .98. The seriousness scores were weighted to reflect greater importance for the medical conditions with high seriousness (low=1, medium=4, and high=9). The seriousness score for each participant was an average of the weighted seriousness scores for all self-reported medical conditions. For example, when two medications were being taken for two separate medical conditions with different serious ratings (low = 1 and high = 9), a seriousness score of five will have been assigned.

If discomfort was likely to occur from not taking a medication for 1 to 2 days a "yes" rating was assigned; if discomfort was not likely to occur, then a "no" rating was assigned. Inter-rater reliability for discomfort ratings was .92. To place more importance on medications prescribed for greater discomfort, a weighted score of one was allotted for no discomfort, and a score of four was allotted for discomfort. The discomfort score for each participant was an average of the weighted discomfort scores for all of their reported medical conditions. For example, when three medications were being taken for three different conditions with different discomfort ratings (yes = 4, no = 1, and no = 1), a discomfort score of two will have been assigned.

Cognitive Performance

Time based prospective memory. The time based memory task required the participant to remember to do something at a specific time in the future, as would be the case when one is required to remember to take a medication at a specific time in the future (i.e., 4:30 p.m.). The researcher asked each participant to remind her to make an

important telephone call "in twenty minutes" (see Appendix C); therefore the target time for this task was 20 minutes from the time of the researcher's request. A possible score of 0 to 3 could be earned for this task. Participants were awarded a score of "0" if they forgot to remind the researcher to make a call. A score of "1" was awarded if the participant reminded the researcher to make the call more than 10 minutes before or after the 20 minute target time. A score of "2" was awarded for reminding the researcher to make the call within 3 to 10 minutes of the target time, and a score of "3" was awarded for reminding the researcher to make the call within 2 minutes of the target time. A high score indicates better performance on the time based prospective memory task.

Event based prospective memory. When the questionnaire package was introduced (Personal Information Sheet, Prospective Memory for Medications Questionnaire, Metamemory In Adulthood Questionnaire, and the Centre for Epidemiologic Studies-Depression Scale), the researcher asked the participant to remove any messy pages, and write the name of the questionnaire on the back of the messy sheet. The name of each questionnaire was clearly marked on the front of each instrument. Participants could have encountered the messy page from 30 minutes to one hour from the time the task was mentioned, depending on the individual's pace in filling out the questionnaires; the page was embedded in approximately the center of the package. The messy page (found in Appendix D) served as an event or memory cue for this prospective task. A score of 0 to 3 was possible on this task. A score of "0" was awarded for doing or saying nothing about the messy page. One point was awarded for recognizing that there was something to be done with the messy sheet (e.g., questioning the researcher

about what was to be done with the page). One point was also awarded for removing the sheet, and one point was awarded for writing the name of the questionnaire on the back of the sheet. These points were then summed to obtain the total score for the event based prospective memory task (see Appendix E). A higher score indicates better performance.

Time based and Event based prospective memory scores were simply summed to create a prospective memory variable which was then standardized and summed with the retrospective standardized variable to create a single standardized memory performance variable. These variables were summed to provide a subject to variable ratio suitable for regression analyses.

Retrospective text recall. Participants were given a one page text containing information about a pseudo medication (Appendix F). The instruction format was based on information distributed by pharmacists about real medications and included the name of the medication, instructions about how to take the medication, and cautions and possible side effects associated with this medication. The pseudo medication, however, was designed so that the medication information would not reflect any real medications that participants might be taking. Participants were asked to read the information as if it was being prescribed to them by their doctor (Appendix G). Participants were encouraged to take as long as they needed to read the text. When finished, they were given a blank sheet of lined paper and were asked to recall, in their own words, as much of the text as possible. There were 158 propositions in the text, and one point was given for each proposition recalled up to a maximum score of 158. Scoring of the medication text propositions by two independent raters had an inter-rater reliability of .95 (tested on

18% of the sample). A high proposition score reflects better memory performance.

Retrospective subject performed tasks (SPTs). Thirty-five word-pairs (Appendix H), consisting of a verb and a noun that together made a simple one step action, were presented to each participant at 10 second intervals. Previous research has indicated that this is an acceptable rate of presentation (McDonald-Miszczak, Hubley, & Hultsch, 1996). Following task instructions (Appendix I), participants were informed that they would be required to remember the list of word-pairs after completion of the task. After all 35 word-pairs had been repeated verbally and each action had been performed by the participant, a sheet of paper was provided in order for subjects to recall as many of the word pairs as possible in seven minutes (Appendix J). No participants required more than seven minutes to complete the recall task. One mark was given for each word-pair or word-pair synonym recalled. The maximum score was 35. The text proposition recall score and the SPT score were each standardized and then summed to create a standardized retrospective cognitive variable.

Strategy Use and the Usefulness of Strategies - PMMQ

The Prospective Memory for Medications Questionnaire (PMMQ) is a 28-item scale used to measure both the perceived use and usefulness of memory strategies for taking medication (Appendix K). These strategies were developed for the Gould et al. (1997) study, and they were based on the Metamemory In Adulthood Questionnaire (MIA; Dixon et al., 1988) memory strategy scales. Participants rated how often they used each medication strategy on a five point likert scale (1 = never to 5 = always). The maximum score possible is five, and a high score indicates greater strategy use.

Participants then rated the usefulness of each strategy on a five point likert scale (1 = agree strongly to 5 = disagree strongly). The maximum score is five, and a high score reflects lower perceived usefulness of strategies.

For some analyses, the PMMQ was subdivided into four memory strategy scales. Seven questions were classified as external prospective (E-P), seven questions were classified as external retrospective (E-R), four questions were classified as internal prospective (I-P), and 10 questions were classified as internal retrospective (I-R) (Gould et al., 1997).

The PMMQ was also subdivided into two memory strategy scales for path analyses in order to investigate whether retrospective and prospective strategy use would differentially predict compliance. Eleven questions were classified as prospective, and seventeen questions were classified as retrospective. Scores for each of the strategy subscales were composed of the average of a participant's responses across all items in that scale. Total scores for both strategy use and strategy usefulness were also composed of the average of a participant's responses across all items in that scale, and these final scores were standardized for use in regressions with other standardized composite scores.

Memory Beliefs

The Metamemory in Adulthood Questionnaire (MIA; Dixon et al., 1988) was used to measure beliefs about memory by asking people to agree or disagree with statements regarding a variety of everyday memory situations (Appendix L). Three scales were used in the present study: memory capacity which is a measure of participant's beliefs about her own memory abilities, memory anxiety which is a measure of participant's anxiety

about her memory in various situations, and memory change which is a measure of perceived change in her memory performance over the past ten years. The MIA has demonstrated good reliability on all scales with Cronbach's alphas ranging from .81 to .93 (Dixon et al., 1988; Hultsch et al., 1988). The Cronbach alphas in the present study sample for anxiety, capacity, and change were .83, .87, and .84 respectively. Participants' responses to the statements about their memory ranged from (1) agree strongly to (5) disagree strongly, with five being the maximum possible score. A high score for each scale reflects belief in high memory capacity, low anxiety about one's memory in various situations, and belief in memory stability over the past ten years. Anxiety, capacity, and change scores were determined by using the average of a participant's responses across all items in that scale. All three scales were standardized separately and then summed to create a single standardized composite "memory beliefs" score for use in regression analyses.

Procedures

Older adults were recruited from the general community of Thunder Bay through local seniors' groups such as the Herb Carol 55+ Centre and seniors' church groups, from information booths set up at local shopping malls, and from the registrar's list of Lakehead University students over the age of 55. These older adults were provided with a short presentation explaining the main purpose of the study followed by an opportunity to volunteer. Potential volunteers filled out a short form (Appendix M) to indicate their interest in participating in the study, and these forms were used to contact the volunteers by telephone to set up an appointment to participate in the study, and to answer any

questions about what their participation would involve. Volunteers were not paid for their participation in the study. Acceptance criteria for participants required that the volunteers were over the age of 55 (except in two cases where participants were close to 55 and fulfilled all other participation requirements), were taking at least one prescription medication at the time of the study, were free from apparent cognitive impairment, were mobile, and were able to complete the questionnaires and memory tasks independently. It is important to note that these older adults represent a healthy population of older adults, as evidenced by their involvement in activities and higher education outside of their home environment. Once it was determined that the acceptance criteria were met, an appointment was made for the volunteer to come to the university, at their convenience, for approximately one and one-half to two hours to complete the questionnaires and perform the memory tasks. Subjects were encouraged at this time to bring a list of the medications they were currently taking.

Upon arrival, the participant was immediately shown to a comfortable chair at a large table with a pen and a digital clock. Next, the researcher explained the purpose of the study (Appendix N), the procedures that would be followed, and the risks and benefits of participation. A consent form was then presented to each participant (Appendix O).

Next, the participant completed the medication questionnaires, and the researcher presented the volunteer with the remaining questionnaires to be completed. These included the personal information questionnaire (Appendix P), the PMMQ (Gould et al., 1997), the MIA (Dixon et al., 1988), and the CES-D (Appendix Q; Radloff, 1977). The researcher then asked the participant to remind her to make an important telephone call in

20 minutes. When the volunteer had agreed to do this, the researcher thanked the participant and introduced him or her to the questionnaire package. As an apparent afterthought, before the researcher left the room, she explained that there had been trouble with the photocopier, and that some of the copies were not clear. The participant was asked to tear out any messy pages she encountered, and write the name of the questionnaire on the back of the page. At this point, the participant was again reminded to call the researcher in 20 minutes. As the researcher left the room, she started a stop watch to record the time that elapsed from this point until the participant reminded her to make the telephone call. The time was recorded in minutes and seconds.

Once the questionnaire package was complete, the questionnaires were removed from the table, and the participant was given the medication text. Participants were asked to read the text just as if they were prescribed the medication by their physician. There was no time limit for reading the text. When the participant indicated that she had finished reading the text, a blank sheet of lined paper was provided, and she was asked to recall as much of the text as possible, in her own words.

After completion of this task, the participant was asked to come into a smaller office, and sit across from the researcher at a desk. The researcher had a screen set up with items hidden from the participant's view. The participant was instructed that a recall task was about to take place, and that she would be required to remember a list of 35 word-pairs that make up actions. Participants were then told that this task would involve three steps. First, the researcher would read a word-pair out loud at a rate of one word-pair every ten seconds; for example "Smell flower." Second, the participant was to repeat

the word-pair out loud. Third, the participant was to perform the action quickly and efficiently (any necessary items were provided, a flower in this example). After all 35 word-pair tasks had been performed, the participant was given a sheet of paper and seven minutes to recall as many of the word pairs as possible.

Once this task had been completed, the researcher debriefed the participant (Appendix R). The cover stories for the time-based (phone call) and event-based (messy page) prospective tasks were described, and the researcher explained that these tasks were planned portions of the experiment. The researcher explained that she had asked the participant to perform these memory tasks to get an accurate measure of certain types of memory, and that the purpose of the memory tasks in this study was to understand the relation between self-reported compliance rates and memory ability.

Chapter Four: Results

Results

Analyses were performed to describe older adults' use of strategies for medication compliance, and to predict strategy use from a range of variables including medical factors, memory performance, importance of compliance, and memory beliefs. Secondly, analyses were performed to predict self-reported compliance from a range of variables including medical factors, cognitive performance, strategy use, perceived importance of strategy use, and memory beliefs. Finally, path analyses were performed to investigate whether the importance of compliance predicts self-reported compliance through strategy use.

Mean-Level Analyses

In preliminary analyses, mean level performance scores on all of the variables included in regression analyses were examined (see table 1). These included self-reported compliance, perceived importance of compliance, medication and medical factors, cognitive performance, strategy use, the perceived usefulness of strategies, and memory beliefs.

Older adults in this sample reported that they complied to their medications over 90% of the time, and although they reported that they agreed it was important to comply to their medications, they did not strongly agree. At the time of the study, older adults were taking an average of three medications (see table 2), and 86% reported suffering from one to four medical conditions in the past five years. These figures are consistent with other studies examining medication use in older adult populations, and with the Gould et al., (1997) research.

Table 1.

Correlations between criterion and predictor variables.

Variable	Comp	Imp C	Med	Mem	Strats	Imp S	Beliefs	I-P	I-R	E-P	E-R	Retro	Pro
1. Imp C	.37*	--											
2. Med	-.23	-.19	--										
3. Mem	-.03	.27	-.26	--									
4. Strats	.12	-.36*	.15	-.14	--								
5. Imp S	.06	.32*	.18	-.04	-.18	--							
6. Beliefs	.06	.04	-.04	.31*	-.25	-.07	--						
7. I-P	.07	-.31*	.21	-.04	.73**	-.01	-.17	--					
8. I-R	.05	-.30*	.15	-.13	.87**	-.16	-.29*	.49**	--				
9. E-P	.17	-.33*	.10	-.18	.69**	-.29*	-.15	.38**	.41**	--			
10. E-R	.14	.01	.08	-.24	.56**	.01	-.19	.42**	.23	.42**	--		
11. Retro	.08	-.27	.13	-.15	.94**	-.14	-.28*	.56**	.96**	.47**	.51**	--	
12. Pro	.15	-.39**	.14	-.09	.85**	-.20	-.15	.80**	.52**	.86**	.51**	.61**	--

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

Note: Comp = Self-Reported Compliance; Imp C = the importance of compliance; Med = medical factor summary variable (including number of medications currently taken, number of conditions suffered from in the last five years, pharmacist ratings of seriousness and discomfort); Mem = memory performance summary variable (including SPT recall, text recall, time and event based prospective memory); Strategy = total strategy use; Imp S = total importance of using strategies; Beliefs = memory beliefs summary variable (including anxiety, capacity and change); I-P; internal prospective strategy use; I-R = internal retrospective strategy use; strategy use; E-P = external prospective strategy use; E-R = external retrospective strategy use; Retro = retrospective strategy use; Pro = prospective strategy use

Table 2.

Sample description of compliance, the importance of compliance and medical factors.

Variable	Mean	Standard Deviation	Range	
			actual	possible
Compliance	7.66	2.99	5-16	5-25
Importance of Compliance	9.54	3.39	5-19	5-25
Number of medications at the time of study: Total sample	3.18	2.75	1-14	1-14
52% of sample	1.35	.49	1-2	1-2
48% of sample	5.17	2.81	3-14	3-14
Number of conditions suffered in past 5 years:	2.52	1.54	0-6	0-6
Seriousness of the medical conditions	3.56	1.98	1-9	1-9
Discomfort due to noncompliance	2.16	1.10	1-4	1-4

Consistent with past research, older adults performed better on the SPT word- pair task than they did on the text recall memory task (Kausler, 1989). Unlike past research however (Einstein et al., 1995; Einstein et al., 1990; Maylor, 1990; Moscovitch, 1982), older adults performed better on time based than event based prospective memory tasks (see table 3). Table 3 also demonstrates that the older adults in this sample held relatively positive beliefs about their memory. Finally, older adults in this sample were more likely to agree that a strategy would be useful than they were to report actually using that strategy regularly (see table 4).

Table 3.

Sample description of metamemory and memory performance.

Variable	Mean	Standard Deviation	Range	
			actual	possible
Prospective Memory Performance:	.86	.93		
Event based			0-3	0-3
Time based	1.72	1.16	0-3	0-3
Retrospective Memory Performance:				
SPT Word Pairs	17.18 (49.1%)	4.5	3-25	0-35
Text Recall Propositions	33.98 (21.5%)	16.5	11-75	0-158
Memory Beliefs:				
Anxiety (hi score=low anxiety)	2.79	.51	1.7-3.9	1-5
Capacity (hi score=hi capacity)	3.02	.54	1.9-4.1	1-5
Change (hi score=low neg change)	2.78	.48	2.0-3.7	1-5

Older Adults Use of Medication Memory Strategies

The first goal of the present study, in replication of the Gould et al. (1997) study, was two-fold: to examine older adults' reports of their use of internal and external memory strategies for medication compliance and to predict strategy use from a range of variables. Older adults were expected to report using internal memory strategies more often than external memory strategies for medication compliance (Gould et al., 1997).

Two possible outcomes were proposed for the prediction of strategy use in the current sample. The first possible predicted outcome was a replication of the Gould et

Table 4.

Sample description of strategy use and the perceived usefulness of strategies.

PMMQ strategy scale	Mean	Standard Deviation	Range	
			actual	possible
Strategy Use:				
Internal Retrospective	3.32	.72	1.7-4.6	1-5
Internal Prospective	2.84	.73	1.0-4.3	1-5
External Retrospective	1.44	.35	1.0-2.4	1-5
External Prospective	1.85	.50	1.0-3.6	1-5
Usefulness of Strategies:				
Internal Retrospective	2.07	.39	1.1-3.2	1-5
Internal Prospective	2.20	.52	1.0-3.5	1-5
External Retrospective	2.78	.61	1.4-3.9	1-5
External Prospective	2.53	.61	1.0-4.0	1-5

al. (1997) study in which two belief variables, the importance of compliance and memory beliefs, predict strategy use. Because of the addition of actual memory performance to the set of predictor variables in the present study, the second possible scenario was the prediction of strategy use by the importance of compliance and by actual memory performance.

Each of the four scales of the PMMQ were examined, and all strategies that were reported to be used regularly (always or often) by over 50% of the sample were identified. In the present study, and as found in the Gould et al. (1997) study, older adults reported using internal more often than external memory strategies for medication compliance, $t(48)= -18.73$, $p<.001$. Eight memory strategies were used regularly by over 50% of

older adults in this sample, and seven of these were internal strategies (see figure 1). Interestingly, seven of these eight strategies were also among those regularly used in the Gould et al. (1997) sample.

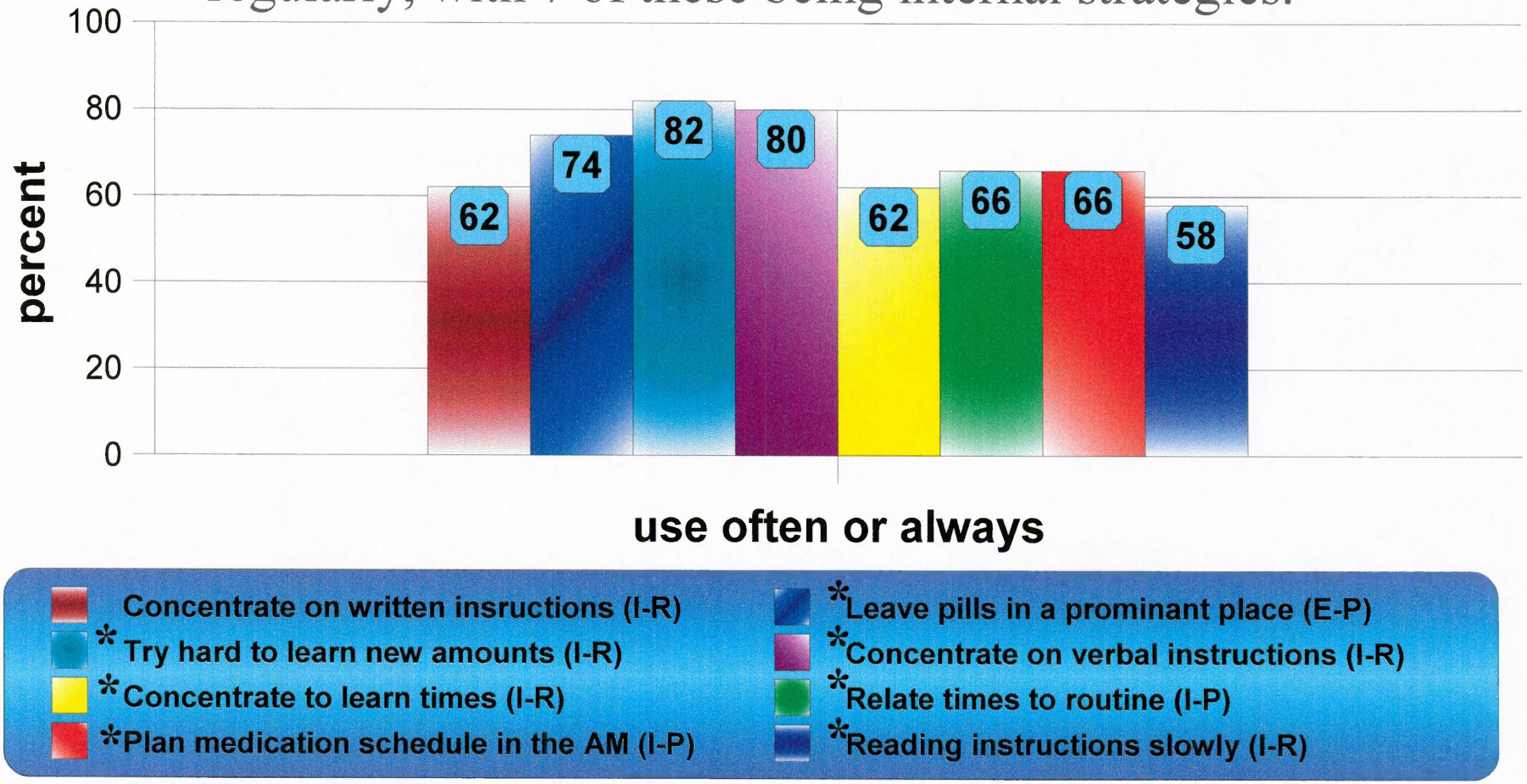
Prediction of Strategy Use: Hierarchical Regression

Part two of the first goal of the present study was to predict strategy use from a range of variables. Two possible outcomes were proposed, and the first possible outcome was a replication of the Gould et al. (1997) study in which two belief variables, the importance of compliance and memory beliefs, predict strategy use. The second possible scenario was the prediction of strategy use by the importance of compliance and by actual memory performance. This was tested using hierarchical multiple regression analyses for each strategy scale.

Four regressions were performed, and the criterion variable used for each of these regressions was an average score for strategy use from the four (PMMQ) strategy scales: (1) External Prospective (E-P), (2) External Retrospective (E-R), (3) Internal Prospective (I-P), and (4) Internal Retrospective (I-R). In each regression there were four blocks of predictor variables, with one variable in each block. The first block consisted of medical and medication factors. The number of current medications, number of conditions suffered over the past five years, seriousness of present conditions, and discomfort of present conditions were standardized separately and then summed to create a single composite variable. The second block contained cognitive performance scores, a summary variable consisting of standardized scores for time and event based prospective task performance as well as standardized text recall and task recall scores. The third

Figure 1. Strategies used for compliance

At least 50% of older adults reported using 8 memory strategies regularly, with 7 of these being internal strategies.



Note: *(I-R)=Internal Retrospective* *(I-P)=Internal Prospective*
(E-R)=External Retrospective *(E-P)=External Prospective*

These strategies were also among those regularly used by the sample of older adults in the Gould et. al. (1997) study.

block was simply the average rating of the importance of self reported compliance across medications. The fourth block contained a summed memory belief variable made up from standardized memory anxiety, memory capacity, and memory change scores.

Neither memory performance nor memory beliefs predicted any of the strategies significantly. However, the importance of compliance significantly predicted the use of certain strategies. Table 5 contains the results for the prediction of internal strategies. None of the variables significantly predicted the use of internal strategies. However, although not significant, the importance that older adults placed on compliance predicted the use of I-P but not I-R strategies at p=.056. Table 6 contains the results for the prediction of external strategies. The importance that older adults placed on compliance significantly predicted the use of E-P but not E-R strategies at p=.01.

Prediction of Self-reported Compliance: Hierarchical Regression

The second goal of the present research was to investigate self-reported compliance. If self-reported compliance is tied to objective factors due to the more specific questions being asked, then medical and cognitive variables were expected to play a greater role in perceived compliance. However, if self reported compliance is not tied to more objective factors, belief related variables were expected to play a greater role in perceived compliance as they did in the Gould et al. (1997) study.

Hierarchical multiple regression was used to determine predictors of self-reported compliance. The criterion variable was the average rating of compliance across medications, and the predictor variables were entered in four blocks. The first block consisted of medical and medication factors. The number of current medications,

Table 5

Predictors of older adults' use of internal medication strategies

Block	Variables	B	R^2 change	F change
DV = INTERNAL PROSPECTIVE (I-P) STRATEGIES (Total RSQ=.17)				
1.	Medical Factors	.22	.05	1.95
2.	Cognitive Performance	-.03	.00	.04
3.	Importance of Compliance	-.33*	.10	3.90*
4.	Memory Beliefs	-.16	.02	.98
DV = INTERNAL RETROSPECTIVE (I-R) STRATEGIES (Total RSQ=.10)				
1.	Medical Factors	.11	.01	.47
2.	Cognitive Performance	-.06	.00	.12
3.	Importance of Compliance	-.27	.07	2.59
4.	Memory Beliefs	-.15	.02	.84

* p=.056

number of conditions suffered over the past five years, seriousness of present conditions, and discomfort of present conditions were standardized separately and then summed to create a single composite variable. The second block contained cognitive performance scores, a summary variable consisting of standardized scores for time and event based prospective task performance as well as standardized text recall and task recall scores. Block three contained two variables: the average rating of strategy use for medication compliance, and the average rating of the importance of strategy use for medication compliance. Both variables in block three were standardized. The fourth block contained the same memory belief variable described in the analyses above. As

Table 6

Predictors of older adults' use of external medication strategies

Block	Variables	B	R^2 change	F change
DV = EXTERNAL PROSPECTIVE (E-P) STRATEGIES (Total RSQ=.17)				
1.	Medical Factors	.05	.00	.10
2.	Cognitive Performance	-.08	.01	.25
3.	Importance of Compliance	-.42*	.16	6.81*
4.	Memory Beliefs	-.07	.00	.18
DV = EXTERNAL RETROSPECTIVE (E-R) STRATEGIES (Total RSQ=.05)				
1.	Medical Factors	.11	.01	.44
2.	Cognitive Performance	-.16	.02	.88
3.	Importance of Compliance	.02	.00	.02
4.	Memory Beliefs	-.13	.02	.60

* p=.01

hypothesized if self-reported compliance was tied to more objective factors due to more specific questions being asked, medical factors contributed significantly to the prediction of self-reported compliance (see table 7).

Prediction of Self-Reported Compliance: A Path Model

The third goal of the present research was to investigate a model of compliance using the new, possibly more objective, measure of self-reported compliance. It was hypothesized that the importance of compliance would predict self-reported compliance differentially through prospective and retrospective memory strategy use.

This was tested using a set of multiple regressions followed by a path analyses.

Table 7

Predictors of older adults' self-reported compliance (Total RSQ=.20)

DV = SELF REPORTED COMPLIANCE				
Block	Variables	B	R^2 change	F change
1.	Medical Factors	-.31	.10	4.00*
2.	Cognitive Performance	-.08	.01	.24
3.	Strategy Use	.22		
	Strategy Usefulness	.13	.05	1.11
4.	Memory Beliefs	.22	.04	1.88

* p=.05

The first regression contained strategy use (either prospective or retrospective) as the criterion variable, and the importance of compliance as the predictor variable. Compliance was the criterion variable for the second regression, and both the importance of compliance and strategy use (either prospective or retrospective) were entered in a single block as the predictor variables. The importance of compliance predicted compliance significantly through prospective but not retrospective strategy use (see Figure 2).

The hypothesized mediation of the relationship between the importance of compliance and self-reported compliance by the use of strategies was tested using LISREL 7. Path analyses were performed on the correlation matrix for four measured variables with one independent variable (IV), and three dependent variables (DV). The IV was the importance of compliance, and the DV's were compliance, retrospective strategy use, and prospective strategy use. The linkage from retrospective strategy use to

compliance was fixed at zero based on the preceding multiple regression analyses. There was no significant difference between the prediction of the model and the sample data, x^2 (1) = .00, p = .958. Further, the fit of the model was nearly perfect with 1 degree of freedom, both the goodness of fit index and the adjusted goodness of fit index were = 1.00. There were significant links from the importance of compliance to prospective strategy use, retrospective strategy use, and to compliance, and from prospective strategy use to compliance. There was no link from retrospective strategy use to compliance. As with the multiple regressions, the importance of compliance predicted compliance significantly through prospective but not retrospective strategy use (see figure 3).

The model accounted for approximately one- third (r^2 = .341) of the total variance, and the maximum likelihood ratios indicated significant amounts of unknown variance for the three DV's: retrospective strategy use (δ = .927), prospective strategy use (δ = .573), and compliance (δ = .761).

Figure 2. Self-reported compliance: Multiple regresssions

Prospective, but not retrospective, strategy use mediates the relationship between the importance of compliance and self-reported compliance.

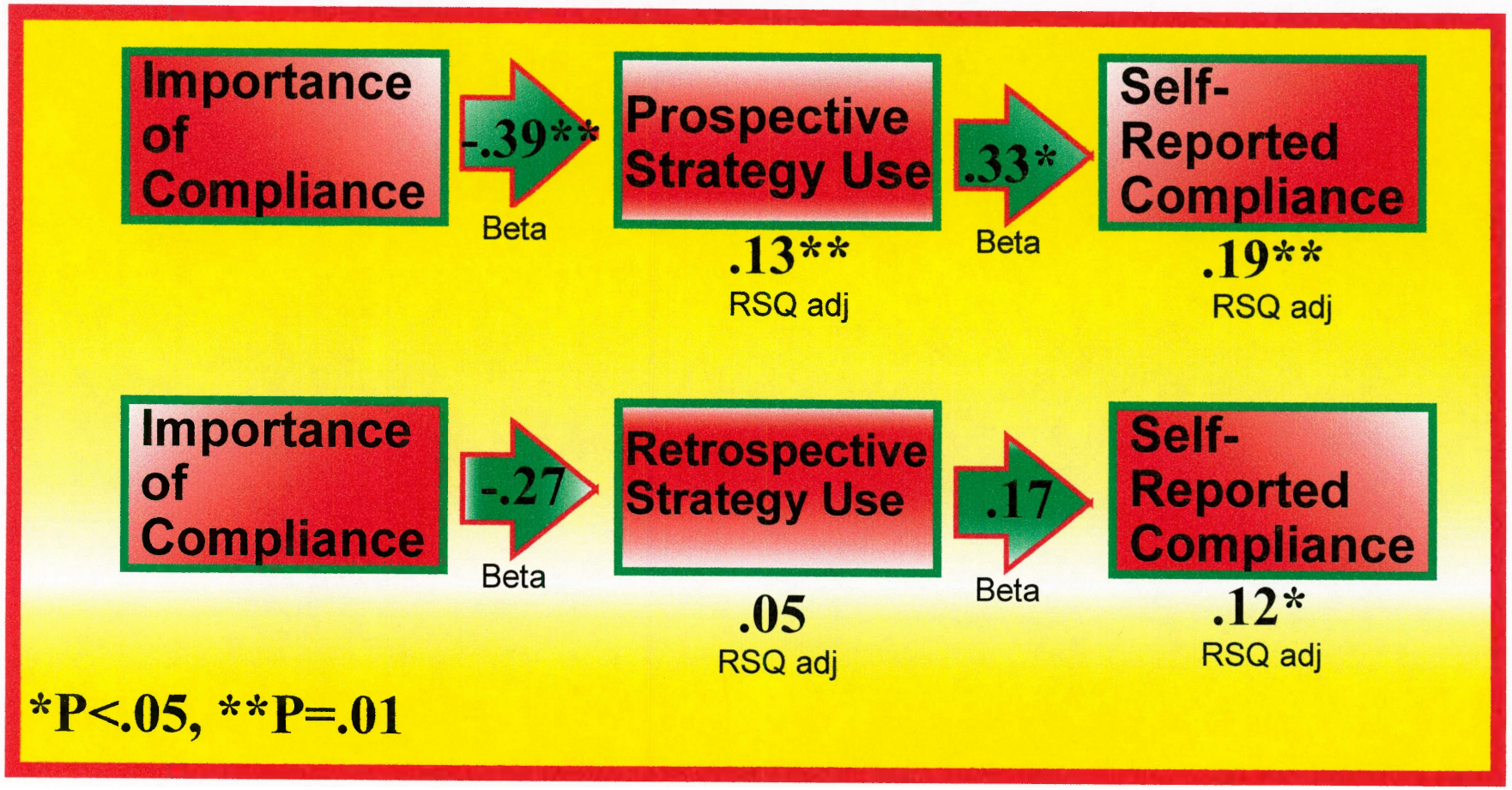
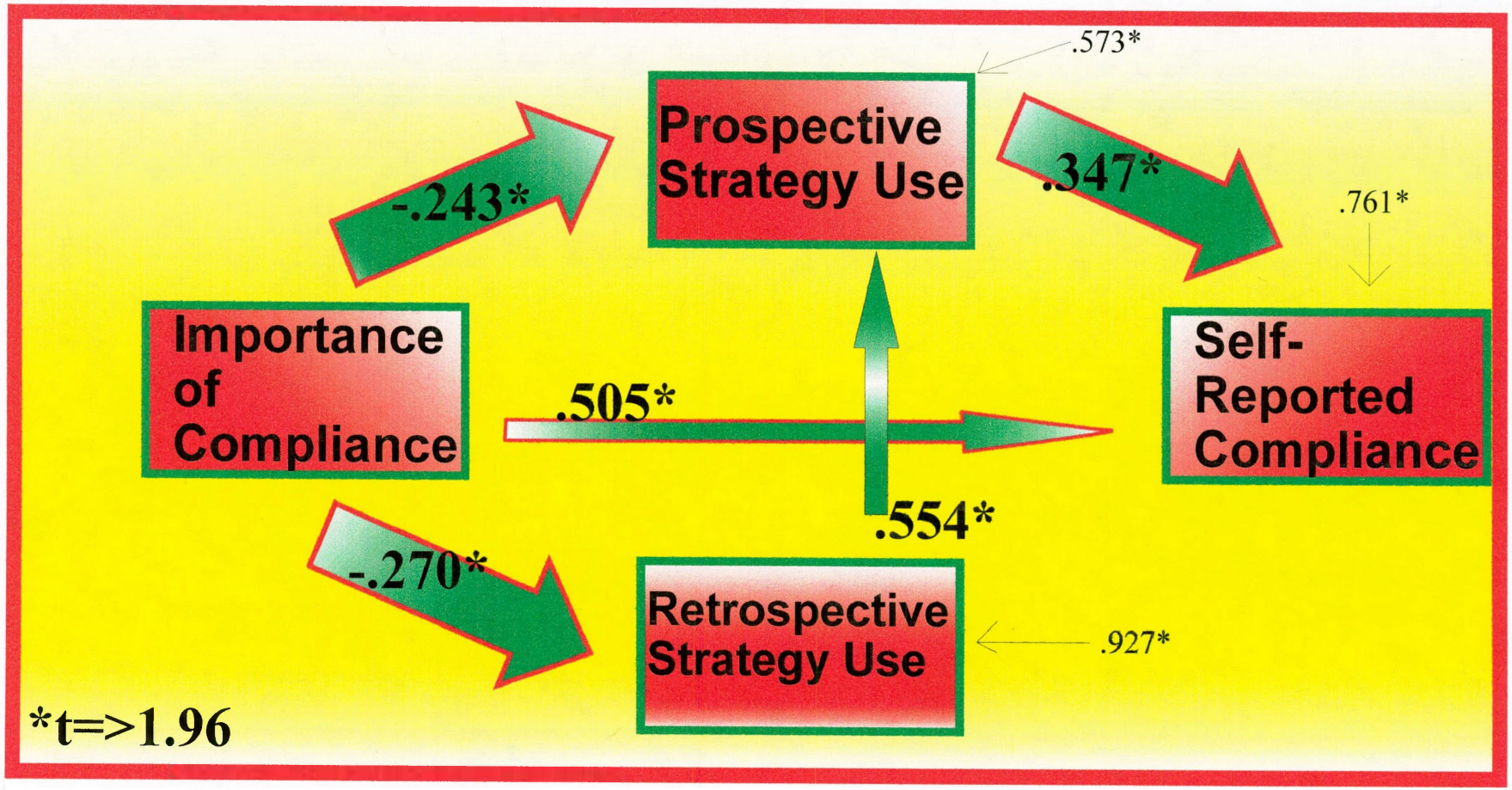


Figure 3. A metacognitive model of self-reported compliance

The importance of compliance predicts self-reported compliance through prospective, but not through retrospective, strategy use.



Chapter Five: Discussion

Discussion

Mean Level Analyses

Although this sample of older adult volunteers is fairly representative of most samples of older adults who volunteer to participate in similar studies (e.g., Gould et al., 1997), it must be recognized that this sample is a sample of convenience, and is not representative of the general older adult population. Participants were relatively healthy, free of apparent cognitive impairment, mobile, white, middle class adults with a relatively high level of education. Further, these people volunteered their time to participate in this study, and this fact alone sets them apart from those adults who chose not to volunteer their time. Those who volunteered may have an interest in memory and medication taking that motivates them to be more likely to adhere to medication regimens than the general population. Those who were isolated in their homes were not invited to participate merely because they were not actively participating in local seniors' groups, and therefore were not accessible. The older adults in this study represent an active, highly functioning segment of the older adult population.

Older Adults' Use of Medication Memory Strategies

The present study had three goals. The first goal was to conduct an investigation of older adults' use of memory strategies in real life in order to replicate Gould et al.'s (1997) research. As in the Gould et al. (1997) study, internal memory strategies were in fact used more frequently than external strategies for medication compliance. Older adults reported the regular use of eight memory strategies, and seven of these were internal rather than external memory strategies.

Further, seven of these eight strategies (including the single external strategy) were also among those strategies regularly used by the sample of older adults in the Gould et al. (1997) study. The strategies that were used regularly by both samples were: leaving pills in a prominent place (E-P), concentrating on verbal instructions (I-R), trying hard to learn new amounts (I-R), concentrating to learn times (I-R), reading instructions slowly (I-R), relating times to routines (I-P), and planning medication schedules in the morning (I-P).

The use of strategies commonly reported by older adults in both of these studies demonstrates an important finding about what types of strategies are being used by older adults to remember their medications. Older adults choose to use internal memory strategies rather than external strategies to remember their medications. It is interesting that older adults chose internal strategies over external strategies for medications yet they were more likely to use external strategies for everyday memory (Gould et al., 1997; Loewen, Shaw, & Craik, 1990).

In the Gould et al. (1997) study, anxiety predicted the use of internal strategies for medication memory, and low memory self efficacy predicted the use of external strategies for medication memory. Post Hoc analyses revealed that anxiety predicted the use of internal medication strategies in this sample as well ($p<.05$). However, low memory self efficacy did not predict the use of external medication memory strategies, but it did predict the use of everyday external memory strategies ($p=.06$). The pattern holds true in that anxiety in both studies was related to the use of internal strategies, and low memory self-efficacy was related to the use of external strategies.

Perhaps anxiety leads to worry and rumination about medication regimens, thus increasing the internal rehearsal of memory instructions. It is reasonable however, that low memory self-efficacy may lead an older adult to choose external strategies. It would make sense that an older adult with low levels of memory self-efficacy would choose not to use internal strategies for memory, because these strategies almost seem to imply reliance on one's own memory. External strategies, however, may be the strategy of choice because they serve as reminders outside of one's own mind or memory.

Reasons other than memory anxiety may also contribute to the choice of internal strategies in older adults for medication compliance. Perhaps older adults choose internal strategies because they are portable and invisible strategies. It is possible that in our society youthful qualities are overvalued, and the use of external (and therefore noticeable) memory aids are considered a crutch or a weakness, a sign of "old age" and failing memory. Older adults may be influenced by such attitudes to choose to use less conspicuous (internal) memory strategies for their medication compliance.

Perhaps anxiety about memory performance is affected by such attitudes and beliefs, and it is through anxiety that these beliefs predict the use of internal strategies for medication compliance. Recall that low memory self efficacy predicted the use of external medication strategies in the Gould et al. (1997) sample, and was correlated with the use of external everyday memory aids in the present sample. What is not clear from either of these studies is wether low memory self efficacy is caused by poor memory performance, or wether it is related to the attitudes held by older adults about their place or value in society. It is possible that such attitudes drive the choice to use memory

strategies, whether internal or external.

Not only do older adults choose to use internal strategies for medication compliance, but five of the eight regularly used strategies were retrospective rather than prospective. Perhaps older adults' perception of "poor memory" does not include prospective memory, but is built on the concept of memory for recent events, or recall of learned information rather than on performing some task in the future. Based on this definition of memory performance, retrospective strategies would seem a natural choice for guarding against memory failure in medication compliance.

It is also possible that the emphasis in the physician's office is on retrospective components of compliance, such as dose and side effects, rather than on the prospective issue of when to take the medication. In fact, post hoc analyses in the present sample revealed that older adults placed significantly more importance on retrospective components of compliance (how much medication do I take?) than on prospective components of compliance (when do I take my medication?), $t\,(48) = -2.08$, $p < .05$. It may be that the prospective task is considered "obvious" by prescribing physicians and pharmacists, and is overlooked as a result.

Indeed, medications are often to be taken "twice daily" or "four times daily" and no further instructions are provided for the prospective component of the task. For example, "With meals" may be a problematic instruction for those who do not eat three meals per day if the intention is to take the medication three times daily. It may make more sense for physicians to spend a few more minutes initially to get to know the routine and the preferred memory strategies of the patient so that the prospective task can be

prescribed specifically to fit into their patient's daily routine.

It is also possible that the measurement instrument is biased towards retrospective strategy endorsement. There are 28 strategy use items in total, with equal numbers of internal and external items (14 each), but with 11 prospective and 17 retrospective items. Perhaps there is a higher probability of endorsing more retrospective items. It may be that creating an equal number of items for each of the four strategy use categories (I-P, I-R, E-P, and E-R) would yield different results. This is an issue for further research using the PMMQ.

It is fascinating to note that most of the regularly used strategies are retrospective strategies, yet errors of omission (or prospective errors) are the most common type of medication compliance errors. It is possible that omission errors are more common because of such strategy use patterns in older adults, or it is possible that older adults are not aware of the fact that omission errors are more likely, and they focus their memory strategies on the retrospective components of compliance. In either case, it is important to note that older adults are using retrospective strategies, when the problem with compliance appears to be prospective in nature.

Prediction of Strategy Use: Hierarchical Regression

It is interesting, despite the regular use of retrospective strategies, that when compliance was deemed more important by older adults, they chose not to use retrospective but prospective strategies, as demonstrated by the significant correlation between the importance of compliance and the use of prospective memory strategies ($p < .01$). Only three out of eight regularly used strategies were prospective, yet these were the

strategies of choice when more emphasis was placed on the importance of compliance.

When addressing compliance issues with older adults, it is clear that more importance needs to be placed on compliance, perhaps especially on the prospective components of compliance. This may increase the use of external prospective strategy use, and decrease the amount of medication omission errors. External prospective strategies have been demonstrated to be effective memory aids for compliance, and emphasis on the importance of compliance coupled with the careful choice of appropriate external prospective aids may prove to be a simple yet effective means of lowering rates of noncompliance in older adults.

Prediction of Self-reported Compliance: Hierarchical Regression

This sample, consistent with past studies, demonstrated high levels of self-reported compliance. However, in contrast to the Gould et al. (1997) study, objective medical factors, rather than subjective factors (such as metamemorial beliefs) significantly predicted self-reported compliance. It was hypothesized that if self-reported compliance was more accurate due to asking more specific questions regarding compliance, then objective medical or cognitive factors would predict self-reported compliance; and it did.

This result however, needs to be interpreted with caution. This caution is because only objective medical variables and not objective cognitive variables contributed significantly to the prediction of self-reported compliance, and also because the subjects' perceived health was not taken into account in this analyses. Perceived health may play an important role in older adults' medication compliance as people may be more likely to

comply to medication instructions when they perceive themselves to be in poor health. Only one question was used to measure perceived health in this study. The participant was asked to rate their own health, compared to a perfect state of health, as "very good", "good", "fair", "poor", or "very poor". This measure of perceived health was significantly correlated with self-reported compliance (as was the objective composite medical score used in the regression analysis), but a single question could not be used as a predictor variable for analyses. In future studies, if measured properly, perceived health may prove to be an important predictor of medication compliance.

The memory measures in this sample need to be considered more closely as well. Time based prospective tasks are believed to be more difficult because of self-initiated retrieval, and older adults generally perform better on event based prospective tasks than on time based tasks. The older adults in this sample, however, performed significantly better on the time based than on the event based prospective memory task, t (46) = -4.50, $p < .001$. In this sample, 23% of the older adults completely forgot to perform the time based prospective task, while 42% forgot to perform the event based prospective task.

The reason for this unexpected finding may be the nature of the prospective tasks that were presented. Older adults were asked to remind the student researcher to "make an important telephone call" because she "forgot her watch" that day. This task sounded very important and fairly immediate, as the reminder was due in twenty minutes. The event based task, however, may not have held the same importance. Participants were to tear out any "messy pages" and write the name of the questionnaire on the back because of "trouble with the photocopier." There was no indication of when this task would

occur, but the messy page was to serve as a cue. This task was not overtly called "important" as was the time based task, and the nature of the consequences of not performing the event based task were less serious than the phone call task. The important phone call could have been about anything, but it was definitely important. However, if they failed to notice a messy page, the worst that would happen is that someone else may also encounter a messy page. Perhaps the importance of the prospective task influenced the task performance, and changed the nature of the memory variable used in analyses.

Further, both of these tasks were presented within a relatively short period of time, along with the presentation of questionnaires and instructions regarding their participation. There were a lot of different things to be remembered, and the older adults may have been most concerned with their participation, and their second concern may have been for the phone call because of the social nature of the task. The event based task may have been lowest on their list of importance, and therefore the most likely to be forgotten. Some older adults didn't even remember hearing the instructions for the event based task when they were debriefed. Again, the perceived importance of a memory task, including medication compliance, may have an impact on the actual performance of that task.

Older adult's performance on the retrospective memory tasks were consistent with past research. Older adults performed better on the everyday actions SPT memory task than they did on the medication text, $t(48) = 15.39$, $p < .001$.

Prediction of Self-reported Compliance: A Path Model

The importance of compliance predicted self-reported compliance through

prospective but not retrospective strategy use. Also, although the correlations between both types of strategy use to compliance and the importance of compliance were not significant in the regression analyses (except for one correlation), there was a pattern to the relationships. There was a negative relationship between the importance of compliance and both prospective ($p < .01$) and retrospective strategy use, and a positive relationship between self-reported compliance and both types of strategy use. This indicates that when older adults place a high level of importance on compliance, they are more likely to use memory strategies, however this relationship was significant only with the use of prospective memory strategies as demonstrated in the path model. However, when the older adults in the present study used strategies, self-reported compliance was lower, though this was significant only with prospective strategy use. This information goes counter to past research and the expectations of the present study that the use of strategies can improve medication compliance.

Recall that compliance is a self-report, and reflects a domain specific metamemorial judgement rather than actual compliance. It is possible that the older adults who believe their compliance to be low (i.e., believe their memory to be poor in the area of medication taking) use memory strategies in order to improve their compliance. It would also make sense that those older adults who believe themselves to be quite compliant (i.e., high memory beliefs) don't use memory strategies because they feel that they are doing fine without them. It is also possible that older adults who reported lower compliance were motivated to report the use of strategies in order to appear more compliant. It is important to note that most of the participants in this study reported a

high level of compliance, so there is a very restricted range of variability in compliance scores, and therefore Type 2 errors are likely - we may not have found what is really there.

A larger sample may provide a larger range of variability, however, given the tendency for people to overestimate their compliance, and given the complexity of compliance, a larger sample may not provide the answer. The path model presented in this study accounted for about one-third of the total variance, which leaves two-thirds of the total variance unexplained. It is not surprising that this simple model does not fully explain the origin of self-reported compliance; this model represents only a small step on the path towards a full analysis of medication compliance. Self-reported compliance is a complex, multifaceted variable, therefore many unknown sources of variability (i.e., perceived health, medical factors, beliefs about memory, memory ability, etc.) should be expected with a simple model that only accounts for a small number of these potential variances.

This study needs to be replicated before confidence can be placed in the results of either the prediction of self-reported compliance from objective medical factors, or the mediation of the relationship between compliance and the importance of compliance by prospective memory strategies. Before pursuing replication however, some methodological changes would be in order. A metamedical factor may be an important next step. Requiring the subject's ratings of perceived seriousness and discomfort to compare with pharmacist ratings would be an interesting study on its own, and using this information as a perceived health scale would allow a more balanced comparison

between objective and subjective factors. The prediction of self-reported compliance could be tested using four blocks of predictors: medical factors, metamedical factors, memory performance, and metamemory. If more specific questions lead to more accurate self-reports of compliance, then objective medical or memory factors would predict compliance where more specific questions were used, and subjective metamedical and metamemorial factors would predict compliance where general questions were used.

Measuring actual compliance as well as self-reported compliance as an additional dependent variable could be used to determine whether accuracy of self-reported compliance was being measured rather than some other unknown variable. Further, measuring actual compliance along with self-reported compliance would help uncover if indeed more focused questioning results in more "accurate" reports of compliance, while allowing the metacognitive path model to be tested against more objective measures of compliance. The importance of compliance (a metamemorial belief) has been demonstrated to influence the use of strategies, and the use of strategies has been demonstrated to influence self-reported compliance, though not as expected. It is likely that, controlling for differences in memory ability and other sources of variance, the use of memory strategies does indeed have a positive impact on compliance, and this may be tested using more objective measures of compliance than a focused self-report.

The next step in the study of memory for medication compliance would require a number of changes to the present study. The researcher would need to test the accuracy of more specific questions for self-reported compliance as outlined above, and to design prospective memory tasks with equal importance. Also, the PMMQ questions could be

balanced in order to match the number of items measuring prospective and retrospective memory strategies. A memory belief scale specific to medication compliance could be developed to examine the effect of everyday memory anxiety vs. medication compliance memory anxiety on the choice of strategy, and to measure the attitudes and beliefs that older adults have about memory (internal vs. external, retrospective vs. prospective). This would test whether or not memory beliefs predict strategy use through anxiety and low memory self-efficacy. In future studies, after replication of this simplistic model, path analyses could be used with a larger sample to test a more complex model, or to test competing metacognitive models of compliance in order to better understand the complex task of medication compliance.

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Appendices

APPENDIX A

ID:_____ MED:_____

Please provide the following information for medications you have taken IN THE LAST MONTH.

MEDICATION

a) Name of the medication: _____

b) Condition treated by this medication:_____

c) WHEN you are supposed to take this medication:

_____

_____

d) HOW MUCH of this medication you are supposed to take each time:

_____

_____

ID:_____ MED:_____

1. Please indicate which physical symptoms you have experienced due to your prescribed medication during the last month.
(Please circle all that apply).

   a. Dizziness
   b. Headaches
   c. Stomach-ache
   d. Chest pain
   e. Difficulty breathing or shortness of breath
   f. Pain in muscles or joints
   g. Numbness or tingling in parts of your body
   h. Indigestion, heartburn or gas
   i. Constipation
   j. Diarrhea
   k. Heart pounding, fluttering or racing
   l. Shaking or trembling
   m. Swollen ankles
   n. Rashes or bruises
   o. Other, please specify:

   _____

2. Please indicate which non-physical symptoms you have experienced due to your prescribed medication during the last month. (Please circle all that apply).

   a. Depression
   b. Increased alertness
   c. Excitement
   d. Anxiousness or nervousness
   e. Drowsiness
   f. Difficulty thinking clearly (such as trouble making decisions)
   g. Confusion or disorientation (such as not knowing what you are doing or where you are).
   h. Other, please specify:

   _____

3. In the last month, it has been important to me to take my medication EXACTLY the way my doctor prescribed (at the right time, in the right amount, and avoiding any foods or beverages as recommended):

   a. Agree strongly
   b. Agree
   c. Undecided
   d. Disagree
   e. Disagree strongly

ID:_____ MED:_____

4. In the last month, what proportion of the time do you believe you have taken your medication EXACTLY the way your doctor prescribed?

   a. Over 90% of the time
   b. 75% to 90% of the time
   c. 50% to 75% of the time
   d. 25% t0 50% of the time
   e. Less than 25% of the time

5. In the last month, it has been important to me to take my medication EXACTLY at the TIME my doctor prescribed:

   a. Agree strongly
   b. Agree
   c. Undecided
   d. Disagree
   e. Disagree strongly

6. In the last month, what proportion of the time do you believe you have taken your medication EXACTLY at the TIME your doctor prescribed:

   a. Over 90% of the time
   b. 75% to 90% of the time
   c. 50% to 75% of the time
   d. 25% to 50% of the time
   e. Less than 25% of the time

7. In the last month, it has been important to me to take my medication in EXACTLY the correct AMOUNTS that my doctor prescribed:

   a. Agree strongly
   b. Agree
   c. Undecided
   d. Disagree
   e. Disagree strongly

8. In the last month, what proportion of the time do you believe you have taken your medication in EXACTLY the correct AMOUNTS your doctor prescribed:

   a. Over 90% of the time
   b. 75% to 90% of the time
   c. 50% to 75% of the time
   d. 25% to 50% of the time
   e. Less than 25% of the time

ID:_____ MED:_____

9. In the last month, it has been important to me to remember the NAME of my prescribed medication:

   a. Agree strongly
   b. Agree
   c. Undecided
   d. Disagree
   e. Disagree strongly

10. In the last month, what proportion of the time do you believe you have remembered the NAME of your prescribed medication:

   a. Over 90% of the time
   b. 75% to 90% of the time
   c. 50% to 75% of the time
   d. 25% to 50% of the time
   e. Less than 25% of the time

11. In the last month, it has been important to me to remember information about possible SIDE-EFFECTS and things to AVOID while taking the medication:

   a. Agree strongly
   b. Agree
   c. Undecided
   d. Disagree
   e. Disagree strongly

12. In the last month, what proportion of the time do you believe you have remembered information about possible SIDE-EFFECTS and things to AVOID while taking the medication:

   a. Over 90% of the time
   b. 75% to 90% of the time
   c. 50% to 75% of the time
   d. 25% to 50% of the time
   e. Less than 25% of the time

13. In the last month, which of the following has been MOST difficult to remember? (Please circle only ONE selection).

   a. The times to take the prescribed medication
   b. The amount of medication to take
   c. The name of the medication
   d. Information about possible side-effects and foods and beverages to avoid while taking the medication.

APPENDIX B

The following list of medications was compiled from community-dwelling older adults in Thunder Bay who are participating in a psychology study at Lakehead University. The medication names have been written exactly as they appeared in the study, by the participants. In addition, the medical conditions treated by these medications have also been written as they appeared in the study. In a few instances, participants were unclear on what condition their medications had been treating, or what the name of the medication was for their condition, and we have indicated this uncertainty by the statement "unknown".

We are interested in examining both the seriousness of the condition treated by these medications, and the discomfort which may result from not taking the medication prescribed for the condition. It is essential for health-care professionals to rate these two aspects of medication-taking (seriousness & discomfort), so that our analysis of these aspects will be valid.

It is important that the health-care professionals DO NOT COMMUNICATE about their answers so that the ratings are independent. The researcher will return to pick up the completed forms two days after the forms are dropped off. Within the following two days, after picking up the completed forms, a researcher will contact the health-care professionals. At this time, it is possible that the researcher will ask the health-care professionals to sit down together to go over some of the items and collaborate on some of the answers. Again, it is important that the researchers DO NOT collaborate before this time.

Each researcher will be paid $75 for their services. The cheques will take approximately 2 weeks to be processed following the completion of the forms and the collaboration of the health-care professionals if requested.

Name:

(First) (Last)

Telephone number:

(where you can be reached by the researcher within two days after completion of the forms)

INSTRUCTIONS

SERIOUSNESS of the condition being treated

Please place a check mark in one of the three assigned categories.

HIGH_____ This rating is given if life threatening complications would result from not taking the medication for 1 to 2 days.

MED_____ This rating is given if long-term life threatening complications would result if no treatment were given.

LOW_____ This rating is given when a failure to receive treatment would not necessarily lead to life threatening complications.

DISCOMFORT resulting from the condition if the medication were not taken for 1 to 2 days.

Please place a check mark in one of the two assigned categories.

YES_____ If discomfort would result from the condition, if medication were not taken for 1 to 2 days.

NO_____ If no discomfort would result from the condition, if the medication were not taken for 1 to 2 days.

*Rating scales will appear after each of the listed medications and medical conditions treated.

**Please do not consult with the other professional during the ratings, as they are to be independent assessments.

ACCUPRIL
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ACCUPRIL
for: hypertension

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ADALAX
for: hypertension

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ADVIL
for: knee pain

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ALDACLAZIDE
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ALAPRIL
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ALLOPURINOL
for: gout

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ALPHAZOLAM
for: insomnia

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ALPHAZOLAM
for: being upset

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

AMLODIPINE BESYLATE
for: heart

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

AMLODIPINE BESYLATE
for: chest pain

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

AMOXCILLIN
for: foot infection

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

APO ATENOLOL
for: arrhythmia

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

APO ATENOLOL
for: high blood pressure

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

APO DICLO
for: arthritis

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

APO-FERROUS GLUCONATE
for: cardiovascular disease

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

APO-FUROSEMIDE
for: blood pressure

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

APO-FUROSEMIDE
for: fluid retention

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

APO-HYDROCHLORTHIZIDE
for: bloating

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

APO-HYDROCHLORTHIZIDE
for: heart

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

APO-METROPROLOL
for: high blood pressure

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

APO-NADAL
for: high blood pressure

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

APO SURFATRIM
for: bladder infection

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

APO-TIMOP
for: glaucoma

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

APO TRIAMZIDE
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

APO RAMITIDINE
for: peptic ulcers

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ASPIRIN
for: blood thinner

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ASPIRIN
for: arthritis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ATIVAN
for: insomnia

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ATIVAN
for: being upset

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ATTENOLOL
for: irregular heartbeat

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ATTENOLOL
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ATROVENT NASAL AEROSOL
for: allergies

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ATROVENT
for: emphysema

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ARTHROTEC
for: arthritis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

BACLOFEN
for: unknown

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

BACTROBAN 2%
for: nose blockage

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

BETAPIC
for: optic nerve

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

BECLOFORTE
for: bronchial asthma

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

BECLOSORTE
for: lung problems

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

BEGAN
for: glaucoma

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

BELCOMETHSAONE
for: sinuses

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

CALCIUM
for: osteoporosis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

CALCIUM 500
for: lactose intolerance

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

CAPTOPRIL
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

CARDIZEM
for: angina/heart

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

CARBOLITH
for: depression

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

CEPHALEXIN
for: bee sting

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

(CIPRO)ANTIBIOTIC
for: foot infection

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

CIPROFLOXACINE
for: unknown

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

CLARITIN
for: nasal congestion

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

CLONDINE
for: night sweats

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

CLYBURIDE
for: diabetes

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

COMBIVENT
for: unknown

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

CONJUGATED ESTROGENS
for: hormones

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

COUMADIN
for: blood thinner

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

COZAAR
for: hypertension

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

CYPRO
for: diabetes

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

DIAZEPAM
for: nerves

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

DIDROCAL KIT
for: osteoporosis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

DIGOXIN
for: arrythmia/heart

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

DIGOXIN
for: low blood pressure

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

DILANTTIN
for: seizures

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

DILTIAZEN
for: angina

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

DILTIAZEN
for: heart

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

DITROPAN
for: prostate

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

DOCUSATE CALCIUM
for: constipation

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

DYDROXEN
for: heart

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ELAVIL
for: fibromalgia

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ELTROXIN
for: hyperthyroid

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ELTROXIN
for: low thyroid

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ENTERIC ASA
for: blood circulation

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ENTREFIN 15
for: blood circulation

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ENTREFIN 15
for: still's disease

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ENTROPHEN
for: arrythmia

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ENTROPHEN
for: blood thinner

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ENTROPHEN
for: arthritic pain

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ESTRADERM
for: hormone replacement

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ESTROGEN VAGINAL CREAM
for: vaginal dryness

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

ERYTHOMID
for: unknown

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

EUGLUCON
for: diabetes

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

EYE DROPS
for: glaucoma

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

FEVOUS GLUCUATE
for: unknown

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

FLAGYL (METRONIDAZOLE)
for: pseudo-membranous colitis

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

FLOVENT
for: COPD

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

FLUOXETINE
for: depression

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

FURSEMIDE
for: diuretic

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

FURSEMIDE
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

FOSAMAX
for: Paget's Disease

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

FORMULEX
for: diverticulosis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

GLIBERCLAMIDE
for: diabetes

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

GLYBURIDE
for: diabetes

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

GEN-ATENOLOL
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

GEN-VERAPAMIL
for: blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

HUMULIN NPH
for: diabetes

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

HYDROCHORLTHIAZIDE
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

HYDROCHLORIOTHIC
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

HYDROCORTISONE CREAM
for: irritation

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

IBUPROFEN
for: arthritis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

INABACE
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

INDOPAMIDE
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ISOPTIN
for: heart

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

IRON PILLS
for: anemia

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

IRON PILLS
for: eye deterioration

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

LANOXIN
for: heart irregularities

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

LESCOL
for: heart problems

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

LEVOTHYROXINE
for: thyroid

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

LIPEDIL
for: cholesterol

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

LIDEX-O
for: psioriasis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

LOMOTIL
for: irritated bowel

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

LOZEC
for: hernia

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

LOZAZEPAM
for: sleeplessness

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

LOZIDE
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

LOVASTATIN
for: cholesterol

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

MANDELAMINE
for: recurrent bladder infection

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

METRONIDAZOLE
for: pseudo membrane colitis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

METROXPROGESTERONE
for: hormones

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

MEVACOR
for: high cholesterol

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

MICARPINE
for: glaucoma

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

MONOPRIL
for: hypertension

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NITROLINGUAL SPRAY
for: heart problems

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NITROGLYCERINE
for: heart pain

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NITROL CREAM
for: arthritis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NITRO DUR (PATCH)
for: small veins

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NITRO-DUR 0.2
for: angina

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NITROLINGUAL SPRAY
for: angina

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVADIFFNAC/VOLTAREN
for: arthritis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NORVASC
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NORVASC
for: still's disease

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NORVASC
for: blood circulation

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVASEN
for: arthritis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVASEN
for: blood circulation

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVASEN
for: blood thinner

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVASEN
for: muscle stiffness

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVO CYCLOPRINE
for: muscle relaxer

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVO DIAPAM
for: sedative

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVODILTAZEM
for: unknown

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVOSEN ASA ENTERIC
for: prevent blood clots

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVOHYDRAZIDE
for: water retention

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVO LORAEPAN
for: relaxation

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVOMEDOPA
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVOMETROPROL
for: heart

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVOMETROPROL
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVOPOXIDE
for: unknown

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVOPUROL (ALLOPURINOL)
for: gout

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

NOVO-SALMOL
for: shortness of breath

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

NOVO SALMOL
for: lung disease

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

NOVO SALMOL
for: emphysema

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

NOVOSPIROTON
for: blood pressure

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

NOVOSORBIDE
for: unknown

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

NOVOSUCRALATE
for: stomach upset

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVOTRIAMIZIDE
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVOTRIMEL
for: recurrant bladder infection

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVOTETRA
for: rosacea acne

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVORANTIDINE
for: heartburn/acid stomach

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVO RANCADINE
for: acid stomach

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

NOVO RANTIDINE
for: prevent ulcers

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

NOVOVEMIDE
for: fluid

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

NOVOXAPASM
for: insomnia/being upset

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

OCUVITE
for: deterioration of eyes

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

OMEPRAZOLE
for: hernia

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

ONE TOUCH STRIPS
for: diabetes

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

ORUVAIL
for: arthritis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

OXAZEPAM
for: insomnia

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

PAXIL
for: depression

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

PAROXETINE
for: anxiety & depression

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

PIROXICAM
for: arthritis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

POTASSIUM
for: diuretic

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

PRAVACOL
for: cholesterol

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

PREDNISONE
for: chronic auto-immune hepatitis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

PREMARIN
for: hormone therapy

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

PREPULSID
for: hernia

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

PROPRANOLOL (INDERIDE)
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

PROPRANOLOL (INDERIDE)
for: hypertension

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

PROVERA
for: hormone replacement

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

PROZAC
for: depression

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

PUOINAL
for: gout

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

RANTIDINE
for: stomach problems

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

RENEDIL
for: hypertension

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

RHINOCORT SPRAY
for: irritated nose and sinus

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

SLONK
for: potassium

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

SPIRONOL ACTONE
for: hypertension

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

SUR-GAUR
for: arthritis

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

SYNTHROID
for: low thyroid, overactive thyroid or fatigue

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

SYNTHROID
for: stomach trouble or heartburn

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

TAMOXIFEN
for: cancer prevention

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

TERFENADINE
for: hives

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

TETRACYKLIN
for: skin eruptions

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

THEOPHYLINE
for: asthma

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

THYROXIN
for: low thyroid

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

TIMOLOL MALCATE
for: glaucoma

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

TIMOLOL MILEATE
for: high blood pressure

Seriousness: **HIGH**_____ **MED**_____ **LOW**_____

Discomfort: **YES**_____ **NO**_____

TOSEC
for: hiatus hernia

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

TOSEC
for: gastritis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

TOSEC
for: stomach upset

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

TRENTAL
for: circulation

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

TRENTAL
for: breathing

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

ULTRADOL
for: anti-inflammatory

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

VASOTEC
for: high blood pressure

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

VENTOLIN
for: asthma/emphysema

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

VERAPAMIL
for: irregular heartbeat

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

VITAMIN D
for: osteoporosis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

VOLTAREN
for: arthritis

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

WARFARIN
for: control blood clotting

Seriousness: **HIGH____** **MED____** **LOW____**

Discomfort: **YES____** **NO____**

WARFARIN-SODA
for: blood circulation

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

WATER PILLS
for: fluid

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

WATER PILLS
for: high blood pressure

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

ZOLOFT
for: depression

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

642
for: arthritis pain

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

CHLOTRIMAZSLE
for: foot fungus

Seriousness: **HIGH**____ **MED**____ **LOW**____

Discomfort: **YES**____ **NO**____

NASAL SPRAY
for: dry nasal passages

Seriousness: **HIGH_____** **MED_____** **LOW_____**

Discomfort: **YES_____** **NO_____**

APPENDIX C

INTRODUCTION OF TIME-BASED TASK:

As the researcher introduces the Personal Information Questionnaire, a request is made to the participant:

"I was wondering if you could do me a favour? While you are filling out these questionnaires, I'm going to be busy in the other room sorting some papers, could you call me in 20 minutes because I'm waiting to hear about a scholarship. The person I talked to earlier told me to call back around (20 minutes from the start time of the first questionnaire). I'm afraid I'll forget to call once I get busy, would you mind calling me? I'll just be outside. Thanks."

INTRODUCTION OF EVENT-BASED TASK:

As an afterthought, before the researcher leaves the room the following will be said:

"Oh, by the way, some of the photocopies are not very clear. I've gone through most of the packages and they look fine, but every once in a while a messy page turns up. If you come across any that are unusable, can you please tear it out of the questionnaire and write the name of the questionnaire that it came from on the back of it so that I can locate them quickly and pull them out myself?"

At this point the participant will again be reminded to call the researcher in 20 minutes.

APPENDIX D: The messy page

When you try to remember people you have met, do you associate names and faces?

a. never
b. rarely
c. sometimes
d. often
e. always

I am good at remembering the order that events occurred.

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

. I am good at remembering conversations I have had.

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

---

37. My memory for phone numbers will decline as I get older.

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree s

---

remember?

---

40. My memory for names has declined greatly in the last 10 years.

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

APPENDIX E

ID _____

RECORD SHEET

****

PROSPECTIVE MEMORY TASKS

****

TIME BASED:
****

TOTAL TIME IN MINUTES & SECONDS:_____

TASK COMPLETION: YES _____ NO_____

COMMENTS:_____
_____
_____
_____
_____

EVENT BASED:
****

TASK COMPLETION: YES _____ NO _____

COMMENTS:_____
_____
_____
_____
_____

****

PRESCRIPTION MEDICATION TEXT

TIME (MINUTES & SECONDS) SPENT STUDYING TEXT:_____

TIME SPENT ON RECALL OF TEXT:_____

****

WORD PAIR TASK

GLOBAL PREDICTION FOR WORD-PAIR MEMORY: _____

****

APPENDIX F

BRAND NAME: MOSETIDIMIDE
COMMON USES: This medicine is used to treat a variety of intestinal conditions. It may also be used to treat other conditions as determined by your doctor.
HOW TO USE THIS MEDICINE: Follow the directions for using this medicine provided by your doctors. This medicine may be taken on an empty stomach or with food. When you first start taking this medicine, it may cause dizziness. To prevent this from affecting your daily routine: if you are taking 1 dose daily, take it before you go to sleep. If you are taking more than one dose, take the first dose as soon as you wake up and the second dose just before bed-time. IF YOU MISS A DOSE OF THIS MEDICINE, take it as soon as possible. If it is time for your next dose, skip the missed dose and go back to your regular dosing schedule. Do not take 2 doses at once.
CAUTIONS: BEFORE YOU BEGIN TAKING ANY NEW MEDICINE either prescriptions or over-the-counter, check with your doctor, nurse or pharmacist. Before using any non-prescription medicines which contain ibuprofen or naproxen, check with your doctor. Drinking alcohol will intensify the effect of this medication. Do not drive, operate machinery, or do anything else that could be dangerous until you know how you react to this medicine.
POSSIBLE SIDE EFFECTS: CHECK WITH YOUR DOCTOR AS SOON AS POSSIBLE if you experience confusion, restlessness, agitation, unusual tiredness or weakness, loss of appetite, nausea, vomiting, diarrhea, changes in heart rate, or changes in vision. If you notice other effects not listed above, contact your doctor, nurse, or pharmacist.

APPENDIX G

INSTRUCTIONS FOR MEDICATION TEXT:

Next, I'm going to show you a text about a certain medication. Please read this information just as if you were prescribed this medication. The information is fairly typical and includes some instructions for taking the medication.

Please take as long as you wish to read it, but keep in mind to read it just as if you had been prescribed the medication by your doctor. I'll be timing how long you spend reading the text, but this is not a timed test. I'm simply interested in how long it takes you to read it as if the medication had been prescribed to you.

IF (AND ONLY IF) THE SUBJECT ASKS ABOUT WHETHER OR NOT THEY WILL BE TESTED ON THE INFORMATION:

After you have finished, I will be asking you for your opinion of the text.

APPENDIX H

ID:_____

GLOBAL PREDICTION: _____

WORD PAIRS

rub elbow	blink eyes
smell flower	close book
hold breath	shrug shoulders
rip paper	wipe forehead
plug ears	squeeze sponge
blow kiss	wave goodbye
fasten pin	drop spoon
wrinkle nose	clap hands
open bottle	tie string
snap fingers	clench teeth
raise eyebrows	fold napkin
rattle keys	scratch chin
touch face	slap thigh
roll dice	count pills
cross legs	lick lips
stack containers	close jar
nod head	whisper hello
wring cloth	

APPENDIX I
MEMORY TASK INSTRUCTIONS

In a moment, we will begin a recall task. This will require you to remember a list of word-pairs that make up actions. For example, EAT / COOKIE is a word-pair that makes up an action. As you can see from the example, the word-pairs involve a VERB / NOUN pairing. In total, there will be 35 of these word-pairs in the list. All of these word-pairs will make sense to you.

The following steps will tell you what you are going to do. There are three basic steps to this procedure:

1. I (the tester) am going to say each word-pair out loud.

2. Then, you should repeat the word-pair out loud.

3. After you say it, you should quickly and efficiently perform the action.

Now it is time for a quick demonstration so that you know what to do. I am going to demonstrate this procedure for you. I will play both my role (the tester) and your role (study participant) so that you can just watch and see how it is done. Don't act anything out now, just watch me carefully.

STEP 1

The tester says the word-pair out loud.

SHUFFLE CARDS

STEP 2

Now this is when you would repeat the word-pair.

SHUFFLE CARDS

STEP 3

This is when you would perform the task.

After you have performed the task, like I just showed you, we will go on to the next word-pair. So for example, let me demonstrate another one to you.

STEP 1

SPELL FRIEND

STEP 2

You would say...

SPELL FRIEND

STEP 3

F-R-I-E-N-D

I'll just do one more to make sure that the procedure is really clear. Please watch...

STEP 1

BEND KNEE

STEP 2

Now you would say,

BEND KNEE

STEP 3

(perform the action)

At this point, is the three-step procedure clear to you? Do you have any questions? Simply remember: (1) say the word-pair, (2) you repeat the word-pair out loud, and (3) then perform the action quickly and efficiently.

Now besides finding out how people will do on this kind of task, I am also interested in how they predict their performance. Out of the list of 35 word-pairs, how many do you think you will remember?

APPENDIX J

ID # _____

In the spaces below, please write down as many word-pairs as you can remember from the list you

have just heard. You may write down the word-pairs in any order you wish. You will have a

maximum of seven (7) minutes to complete the task.

1. _____ / _____
2. _____ / _____
3. _____ / _____
4. _____ / _____
6. _____ / _____
7. _____ / _____
8. _____ / _____
9. _____ / _____
10. _____ / _____
11. _____ / _____
12. _____ / _____
13. _____ / _____
14. _____ / _____
15. _____ / _____
16. _____ / _____
17. _____ / _____
18. _____ / _____
19. _____ / _____
20. _____ / _____
21. _____ / _____
22. _____ / _____
23. _____ / _____
24. _____ / _____
25. _____ / _____
26. _____ / _____
27. _____ / _____
28. _____ / _____
29. _____ / _____
30. _____ / _____
31. _____ / _____
32. _____ / _____
33. _____ / _____
34. _____ / _____
35. _____ / _____

APPENDIX K

Memory for Medications Questionnaire

Directions

In this questionnaire, we would like you to tell us about some strategies that you may use to help you remember to take your medications correctly. We are interested in how people to manage to remember how much medication to take (e.g., how many pills) and what time of day to take the medication. There are no right or wrong answers to these questions because people are different. Some people use strategies to help them remember, and others do not. Please take your time and answer each of these questions to the best of your ability.

For each of the strategies that are listed, there are two questions:

The first question asks you how often you use this strategy. This question is followed by five choices. Draw a circle around the letter corresponding to your choice. Mark only one letter for each statement.

For example:

_____ Do you make lists of your prescribed medications?

a. never
b. rarely
c. sometimes
d. often
e. always

The second question asks you whether you think this strategy is effective in helping people remember to take their medications.

- If you use this strategy, or have ever used this strategy, tell us whether you found it to be helpful in helping you remember.

- If you answered NEVER in the first question, then please give us your opinion of how effective you believe this strategy would be if you were to use it.

For example:

_____ I believe that making a list of my prescribed medications is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

Please keep these points in mind:

– Answer every question, even if it doesn't seem to apply to you very well.

– Answer as honestly as you can what is true for you. Please do not mark something because it seems like the "right thing to say".

1) Do you use a clock or watch alarm to remind you when it is time to take your medication?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that using a clock or watch alarm to remind me when it is time to take my medication is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

2) Do you ask your doctor to speak slowly when giving you medication instructions?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that asking my doctor to speak slowly when giving me medication instructions is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

3) Do you ask other people to remind you what time to take your medications?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that asking other people to remind me what time to take my medication is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree

e. disagree strongly

4) Do you count on other people to remind you what time to take your medications?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that counting on other people to remind me what time to take my medication is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

5) Do you use a dated pillbox to help you make sure you take the right amount of medication per day?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that using a dated pillbox to help me make sure to take the right amount of medication per day is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

6) When you try to learn the names of your prescriptions, do you try to associate the name of the medication with the name of the condition it is treating?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that when you try to learn the names of your prescriptions, associating the name of a medication with the name of the condition is (or would be) helpful:

a. agree strongly

b. agree
c. undecided
d. disagree
e. disagree strongly

7) When you want to remember written medication instructions (pill bottle labels, written doctor's instructions), do you read them more than once?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that when I want to remember written medication instructions, reading them more than once is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

8) Do you leave notes for yourself in prominent places to remind you when to take your medications?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that leaving notes for myself in prominent places to remind me when to take my medications is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

9) When you want to remember when to take your medications, do you try to relate the medication times to something else you routinely do (like meal times) to remember better?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that when I want to remember when to take my medications, that relating the medication times to something else I routinely do (like meal times) is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

10) At the beginning or the day, do you think about when you need to take your medication so you can include your medications into your day's schedule?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that thinking about when I need to take my medications at the beginning of the day so I can include my medications into my day's schedule is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

11) Do you ask other people to remind you how to take your medication? (e.g. taking your medication with milk, or avoiding certain foods)?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that asking other people to remind me how to take my medication is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

12) Do you count on other people to remind you how to take your medication (e.g., taking your medication with milk, or avoiding certain foods)?

a. never

b. rarely
c. sometimes
d. often
e. always

I believe that counting on other people to remind me how to take my medication is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

13) When you are receiving instructions on when and how to take your medications, do you make mental images or pictures to help you remember?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that making mental images or pictures when I am receiving instructions on when and how to take my medications is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

14) Do you spend a lot of time making plans or using aids for memory to help you take your medications on time?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that spending a lot of time making plans or using aids for memory to help me take my medications on time is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

15) When you have trouble remembering to take your medications, do you try to relate the medication times to some event that is specific to that day (e.g., I need to take my pill when I return from shopping)?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that trying to relate my medication times to some event that is specific to that day is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

16) Do you regularly repeat to yourself the instructions for taking a prescription that you've been taking for a long time?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that regularly repeating to myself the instructions for taking a prescription that I've been taking for a long time is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

17) Do you have a pill bottle or pill box in a prominent place to remind you to take your medication?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that leaving my pills in a prominent place to remind me to take my medication is (or would be) helpful:

a. agree strongly

b. agree
c. undecided
d. disagree
e. disagree strongly

18) Do you write yourself notes as reminders of your medication instructions?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that writing myself notes as reminders of my medication instructions is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

19) When you want to remember the name of a particular medication, do you ask somebody else to help you remember?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that when I want to remember the name of a particular medication, asking somebody else to help me remember is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

20) Do you try to concentrate hard when reading medication instructions (e.g., pill bottle labels, written doctor's instructions)?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that concentrating hard when reading medication instructions is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

21) When you want to remember written medication instructions (e.g., pill bottle labels, written doctor's instructions), do you read them more slowly?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that when I want to remember written medication instructions, reading them more slowly is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

22) Do you leave notes for yourself in prominent places to remind you how to take your medications (e.g., with milk, avoid certain foods)?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that leaving notes for myself in prominent places to remind me how to take my medications is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

23) Do you make a mark on a calendar when you've taken your medication each day?

a. never
b. rarely
c. sometimes

d. often
e. always

I believe that making a mark on a calendar when I've taken my medication each day is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

24) When you are trying to learn new medication instructions, do you mentally repeat the instructions to help you remember them?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that when I am trying to learn new medication instructions, mentally repeating the instructions is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

25) Do you ask other people to remind you about the amounts of a medication to take (e.g., how many pills)?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that asking other people to remind me about the amounts of a medication to take is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

26) Do you count on other people to remind you about the amounts of medication to take (e.g., how many pills)?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that counting on other people to remind me about the amounts of a medication to take is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

27) Do you try to concentrate hard when receiving verbal medication instructions from your doctor or pharmacist?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that concentrating hard when receiving verbal medication instructions from my doctor or pharmacist is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

28) Do you keep a written list of the times and amounts of the medications that you need to take?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that keeping a written list of the times and amounts of the medications that I need to take is (or would be) helpful:

a. agree strongly
b. agree

c. undecided
d. disagree
e. disagree strongly

29) Do you try hard to learn the amounts to take when you are prescribed a new medication?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that trying hard to learn the amounts to take when I am prescribed a new medication is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

30) When you get a new prescription for medication, do you ask somebody else to help you remember when to take your medication and how to take it (e.g., with milk, avoid certain foods)?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that when I get a new prescription for medication, asking somebody else to help me remember when to take my medication and how to take it is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

31) When you get a new prescription for medication, do you count on somebody else to help you remember when to take your medication and how to take it (e.g., with milk, avoid certain foods)?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that when I get a new prescription for medication, counting on somebody else to help me remember when to take my medication and how to take it is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

32) When you get a new prescription, do you concentrate a lot to learn the times for taking your medication?

a. never
b. rarely
c. sometimes
d. often
e. always

I believe that when I get a new prescription, concentrating a lot to learn the times for taking my medication is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

33) Please list any other strategies that you have ever used to help you remember your medication instructions.

STRATEGY 1:

_____

_____

_____

Please indicate how often you use this strategy:

a. never
b. rarely
c. sometimes
d. often
e. always

I believe this strategy is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

STRATEGY 2:

_____

_____

_____

Please indicate how often you use this strategy:

a. never
b. rarely
c. sometimes
d. often
e. always

I believe this strategy is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

STRATEGY 3:

_____

_____

_____

Please indicate how often you use this strategy:

a. never
b. rarely
c. sometimes
d. often
e. always

I believe this strategy is (or would be) helpful:

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

APPENDIX L
MEMORY QUESTIONNAIRE

Directions

Different people use their memory in different ways in their everyday lives. For example, some people make shopping lists, whereas others do not. Some people are good at remembering names, whereas others are not.

In this questionnaire, we would like you to tell us how you use your memory and how you feel about it. There are no right or wrong answers to these questions because people are different. Please take your times and answer each of these questions to the best of your ability.

Each question is followed by five choices. Draw a circle around the letter corresponding to your choice. Mark only one letter for each statement.

Some of the questions ask your opinion about memory-related statements; for example:

My memory will get worse as I get older

a. agree strongly
b. agree
c. undecided
d. disagree
e. disagree strongly

In this example you could, of course, choose any one of the answers. It you agree strongly with the statement you would circle a. If you disagree strongly you would circle letter e. The b and d answers indicate less strong agreement or disagreement. The letter c answer gives you a middle choice, but don't use the c unless you really can't decide on any of the other responses.

Some of the questions ask how often you do certain things that may be related to your memory. For example:

Do you make a list of things to be accomplished during the day?

a. never
b. rarely
c. sometimes
d. often
e. always

Again, you could choose any one of the answers. Choose the one that comes closest to what you usually do. Don't worry if the time estimate is not exact, or if there are some exceptions.

Keep these points in mind:

a) Answer every question, even if it doesn't seem to apply to you very well.
b) Answer as honestly as you can what is true for you. Please do not mark something because it seems like the "right thing to say".

1.	I am good at remembering names.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
2.	Do you keep a list or otherwise note important dates, such as birthdays and anniversaries?	a. never b. rarely c. sometimes d. often e. always
3.	I get upset when I cannot remember something.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
4.	When you are looking for something you have recently misplaced, do you try to retrace your steps in order to locate it?	a. never b. rarely c. sometimes d. often e. always
5.	I find it harder to remember things when I am upset.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
6.	I am good at remembering birthdates.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
7.	I can remember things as well as always.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
8.	When you have not finished reading a book or magazine, do you somehow note the place where you have stopped?	a. never b. rarely c. sometimes d. often e. always

9.	I get anxious when I am asked to remember something.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
10.	I'm less efficient at remembering things now then I used to be.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
11.	I have difficulty remembering things when I am anxious.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
12.	The older I get the harder it is to remember clearly.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
13.	Do you think about the day's activities at the beginning of the day so you can remember what you are supposed to do?	a. never b. rarely c. sometimes d. often e. always
14.	I am just as good at remember as I ever was.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
15.	I have no trouble keeping track of my appointments.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
16.	Most people find it easier to remember directions to places they want or need to go than to places they know they will never be going.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

17.	I am usually uneasy when I attempt a problem that requires me to use my memory.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
18.	I feel jittery if I have to introduce someone I just met.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
19.	Do you post reminders of things you need to do in a prominent place, such as bulletin boards or note boards?	a. never b. rarely c. sometimes d. often e. always
20.	I am poor at remembering trivia.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
21.	I am much worse now at remembering the content of news articles and broadcasts than I was 10 years ago.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
22.	Do you routinely keep things in a familiar spot so you won't forget them when you need to locate them?	a. never b. rarely c. sometimes d. often e. always
23.	Compared to 10 years ago, I am much worse at remembering titles of books, films, or plays.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
24.	I remember my dreams much less now than 10 years ago.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

25.	I can't expect to be good at remembering postal codes at my age.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
26.	I have little control over my memory ability.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
27.	When you want to take something with you, do you leave it in an obvious, prominent place, such as putting your suitcase in front of the door?	a. never b. rarely c. sometimes d. often e. always
28.	I misplace things more frequently now than when I was younger.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
29.	As people get older they tend to forget where they put things more frequently.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
30.	Compared to ten years ago, I now forget many more appointments.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
31.	If I am put on the spot to remember names, I know I will have difficulty doing it.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
32.	My memory for important events has improved over the last 10 years.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

33.	When you try to remember people you have met, do you associate names and faces?	a. never b. rarely c. sometimes d. often e. always
34.	I am good at remembering the order that events occurred.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
35.	I am good at remembering conversations I have had.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
36.	I would feel on edge right now if I had to take a memory test or something similar.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
37.	My memory for phone numbers will decline as I get older.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
38.	My memory for dates has declined greatly in the last 10 years.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
39.	When you have trouble remembering something, do you try to remember something similar in order to help you remember?	a. never b. rarely c. sometimes d. often e. always
40.	My memory for names has declined greatly in the last 10 years.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

41.	I often forget who was with me at events I have attended.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
42.	Do you consciously attempt to reconstruct the day's events in order to remember something?	a. never b. rarely c. sometimes d. often e. always
43.	As long as I exercise my memory it will not decline.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
44.	I am good at remembering the places I have been.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
45.	I know if I keep using my memory I will never lose it.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
46.	Do you try to relate something you want to remember to something else hoping that this will increase the likelihood of your remembering later?	a. never b. rarely c. sometimes d. often e. always
47.	When I am tense and uneasy at a social gathering I cannot remember names very well.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
48.	Do you try to concentrate hard on something you want to remember?	a. never b. rarely c. sometimes d. often e. always

49.	It's up to me to keep my remembering abilities from deteriorating.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
50.	When someone I don't know very well asks me to remember something I get nervous.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
51.	I have no trouble remembering where I have put things.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
52.	Even If I work on it, my memory ability will go downhill.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
53.	Do you make mental images or pictures to help you remember?	a. never b. rarely c. sometimes d. often e. always
54.	I know of someone in my family whose memory improved significantly in old age.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
55.	I am good at remembering things like recipes.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
56.	I get anxious when I have to do something I haven't done for a long time.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

57.	Do you mentally repeat something you are trying to remember?	a. never b. rarely c. sometimes d. often e. always
58.	My memory has improved greatly in the last 10 years.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
59.	I get tense and anxious when I feel my memory is not as good as other peoples'.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
60.	Do you ask other people to remind you of something?	a. never b. rarely c. sometimes d. often e. always
61.	I do not get flustered when I am put on the spot to remember new things.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
62.	I am good at remembering titles of books, films and plays.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
63.	My memory has declined greatly in the last 10 years.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
64.	I have no trouble remembering lyrics of songs.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

65.	My memory will get better as I get older.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
66.	Do you write yourself reminder notes?	a. never b. rarely c. sometimes d. often e. always
67.	I am good at remembering names of musical selections.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
68.	After I read a book I have no difficulty remembering factual information from it.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
69.	Do you write appointments on a calendar to help you remember them?	a. never b. rarely c. sometimes d. often e. always
70.	I would feel very anxious if I visited a new place and had to remember how to find my way back.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
71.	I am good at remembering the content of news articles and broadcasts.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
72.	No matter how hard a person works on his memory, it cannot be improved very much.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly

73.	If I were to work on my memory I could improve it.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
74.	Remembering the plots of stories and novels is easy for me.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
75.	I am usually able to remember exactly where I read or heard a specific thing.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
76.	I think a good memory comes mostly from working at it.	a. agree strongly b. agree c. undecided d. disagree e. disagree strongly
77.	Do you write shopping lists?	a. never b. rarely c. sometimes d. often e. always

APPENDIX M

YES, I AM INTERESTED IN PARTICIPATING IN THE SALT PROJECT.
(Your name and phone number will be used
only to schedule your appointment)

NAME:_____

YEAR OF BIRTH:_____ SEX:_____

PHONE NUMBER:

HOME:_____ WORK:_____

ADDRESS:_____

_____

THE BEST TIMES TO REACH ME ARE:_____

_____

Would it be alright if we contacted you in the future when we are conducting a different type of study?

YES _____ NO _____

APPENDIX N

MEMORY FOR MEDICATIONS

Purpose of the Study

The purpose of this study is to investigate various important measures that may affect medication taking.

Procedures to be Followed

During this study you will be asked to complete a number of questionnaires and perform a few memory tasks. More specifically we will ask you to:

1) Tell us about your age, educational background, health status, and give descriptions of any current medications that you are taking.

2) Tell us how you feel about your memory.

3) Described the different strategies that you use to help you remember to take your medications as well as your personal opinions about the usefulness of these strategies.

4) Perform a few memory tasks.

Time Required

Your participation will last about 1.5 to 2 hours.

Risks and Benefits

Being asked to perform a task or take a test can sometimes be a stressful experience. It is, however, through the cooperation of individuals such as yourself that we with interests in Life-Span Development Psychology are able to understand how adults remember.

APPENDIX O
LAKEHEAD UNIVERSITY

INFORMED CONSENT FORM

Title of Investigation: TAKING MEDICATIONS

Investigators: Leslie McDonald-Miszczak, Ph.D
Florence MacLean, Psyc. Honors Program

This is to certify that I, _____ hereby agree to participate as a volunteer in a scientific study as an authorized part of the educational research program at Lakehead University.

The study and my part in it have been defined by the investigator and I understand the summary. The procedures of this study are described on the first page of this form and have been presented in detail.

I have been given an opportunity to ask whatever questions I may have had and all such questions and inquiries have been answered to my satisfaction.

I understand that I am free to refuse to participate in any specific task or to refuse to answer any specific test questions.

I understand that any data or answers to questions will remain confidential with regard to my identity.

I certify that to the best of my knowledge and beliefs, I have no physical illness or other problem that would increase the risk to me due to participation in this study.

I FURTHER UNDERSTAND THAT I AM FREE TO WITHDRAW MY CONSENT AND TERMINATE MY PARTICIPATION AT ANY TIME.

Date: _____ Signature of Participant _____

I, the undersigned, have defined and fully explained the above to the participant in detail, and to my best knowledge and belief it was understood.

Date: _____ Signature of Investigator _____

APPENDIX P
PERSONAL INFORMATION SHEET

In order to better understand the results of our study, we need to know a few things about you and your background. This information will be used for research purposes and it will be kept strictly confidential.

1) My birth date is: _____
(day) (month) (year)

2) My gender is:

a. male b. female

3) I am:

a. married
b. single
c. widowed
d. divorced
e. common-law relationship

4) How old do you feel mentally? _____ years

5) How old do you feel physically? _____ years

6) Who else lives in your home? (circle all that apply)

a. my spouse
b. my adult son or daughter
c. one or more children
d. an adult who is not related to me
e. I live alone
f. other (please specify) _____

7) How often do you engage in social activities such as visiting friends at their house, eating at restaurants, attending musical performances, and other similar activities?

a. less than once a month
b. 1 - 2 times a month
c. 1 - 2 times a week
d. more than 3 times a week

8) How often do you have wine, beer or other alcoholic drinks?

a. about once a day
b. 1 - 2 times a week
c. 2 - 3 times a week
d. about once a month
e. several times a year
f. about once a year or less
g. never

9) When you have alcoholic beverages, how much do you have?

a. I never drink alcoholic beverages
b. 1 - 2 drinks
c. 3 - 4 drinks
d. 5 - 6 drinks
e. more than six drinks

10) Please indicate the level of education that you have completed:

a. Did you complete primary school (Grade 8)?

a. yes
b. no

b. Did you complete high school (Grade 12)?

a. yes
b. no

c. How many years did you attend college, university, or training school?

_____ years

11) Currently, I am (please circle all that apply)

a. employed full time
b. employed part time
c. retired
d. full-time homemaker
e. part-time homemaker
f. doing volunteer work
g. a full-time student
h. a part-time student
i. other _____

12) If you are retired:

When did you retire from full-time employment? _____

13) What is your primary occupation? (If you are retired, please indicate your former occupation) _____

THE FOLLOWING ARE A FEW QUESTIONS ABOUT YOUR GENERAL HEALTH:

14) Compared to a perfect state of health, I believe my overall health to be (please circle one):

a. very good
b. good
c. fair
d. poor
e. very poor

15) Compare to other people my age, I believe my overall health to be (please circle one):

a. very good
b. good
c. fair
d. poor
e. very poor

16) I use the following corrective lenses for my eyesight:

a. I don't use glasses or contact lenses
b. glasses or contact lenses for distances
c. glasses or contact lenses for reading or close work

17) Do you require a hearing aid?

a. yes
b. no

18) How many times have you visited your doctor in the past 12 months?

a. none
b. once
c. 2 - 5 times
d. 6 - 12 times
e. over 12 times

19) How many nights have you spent in a hospital or nursing home during the last 12 months?

a. none
b. 1 - 6 nights
c. 1 - 3 weeks
d. 1 month or more

20) Please indicate which medical conditions you have experienced in the last five years (circle all that apply).

a. anemia
b. arthritis/rheumatism
c. asthma
d. bronchitis
e. cancer
f. cataracts
g. COPD/emphysema
h. diabetes
i. epilipsy/seizures
j. glaucoma
k. gout
l. headaches
m. heart disease
n. hepatitis
o. high blood pressure
p. influenza
q. kidney disease
r. multiple sclerosis
s. Parkinson's disease
t. pneumonia
u. polio effects
v. thyroid disease
w. tuberculosis
x. stroke or effects of stroke
y. ulcers
z. other, please specify: _____

21) Have you had the following surgeries during the last 5 years? (circle all that apply)

a. appendectomy
b. back surgery
c. endarterectomy/carotid surgery (to clear arteries in the neck)
d. gallbladder surgery
e. hernia repair
f. hysterectomy
g. mastectomy
h. open heart surgery
i. prostrate surgery
j. tonsillectomy

22) How many different medications has your doctor prescribed to you in the last two years?

a. none
b. 1 - 2 different medications
c. 3 - 4 different medications
d. 5 - 6 different medications
e. 7 or more different medications

23) How many different prescribed medications are you taking now?

a. none
b. 1 - 2 different medications
c. 3 - 4 different medications
d. 5 - 6 different medications
e. 7 or more different medications

APPENDIX Q

MOOD QUESTIONNAIRE

In this booklet, there are statements about the way that most people feel at one time or another. There is no such thing as a "right" or "wrong" answers, because people are different. All you have to do is answer the statements according to how you have felt during the past week. Don't answer according to how you usually feel, but rather how you have felt during the past week. Each statement is followed by four choices. Mark a circle around the letter corresponding to your choice. Mark only one letter for each statement. For example:

During the past week, I was happy.

a. Rarely or none of the time (less than one a day)
b. Some or a little of the time (1-2 days)
c. Occasionally or a moderate amount of the time (3-4 days)
d. Most or all of the time (5-7 days)

In the example, you could, of course, choose any one of the answers. If you felt really happy, you would choose and circle d. If you felt very unhappy you would circle a. The b. and c. answers give you middle choices.

Keep these points in mind:

a) Don't spend too much time thinking about your answer. Give the first natural answer as it comes to you.

b) Answer every question, even if it doesn't seem to apply to you very well.

c) Answer as honestly as you can what is true of you. Please do not mark something because it seems like "the right thing to say".

1. During the past week I was bothered by things that usually don't bother me.
    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

2. During the past week I did not feel like eating; my appetite was poor.
    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

3. During the past week I felt that I could not shake off the blues even with help from my family or friends.
    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

4. During the past week I felt that I was just as good as other people.
    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

5. During the past week I had trouble keeping my mind on what I was doing.
    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

6. During the past week I felt depressed.
    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

7. During the past week I felt that everything I did was an effort.

    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

8. During the past week I felt hopeful about the future.

    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

9. During the past week I thought my life had been a failure.

    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

10. During the past week I felt fearful.

    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

11. During the past week my sleep was restless.

    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

12. During the past week I was happy.

    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

13. During the past week I talked less than usual.

    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

14. During the past week I felt lonely.

    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

15. During the past week people were unfriendly.

    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

16. During the past week I enjoyed life.

    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

17. During the past week I had crying spells.

    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

18. During the past week I felt sad.

    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

19. During the past week I felt that people dislike me.

    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

20. During the past week I could not get "going".

    a. Rarely or none of the time (less than one a day)
    b. Some or a little of the time (1-2 days)
    c. Occasionally or a moderate amount of the time (3-4 days)
    d. Most or all of the time (5-7 days)

APPENDIX R
DEBRIEFING

Now that we are finished the session, I would like to tell you some things about the study that you have just participated in.

First of all, I would like to thank you for participating in this study. Without individuals such as yourself, researchers interested in developmental psychology would not be able to examine many important issues.

The purpose of this research was to see whether there are age differences in how people remember to take their medications. Obviously, remembering to take our medications is extremely important for maintaining good health and promoting optimal development in life. However, many older adults are prescribed several medications that may have very complicated dosage schedules. We are interested in how older adults remember to take their medications (as compared with younger adults) and we are interested in other factors that might be related to their self-reported compliance.

Other researchers have found that adults' (both younger and older) reports of compliance with their medications is not very accurate. Generally, when our doctor asks us how accurately we are sticking to our medication regimen, we are not very accurate when we reply. Although this can be a very complicated question to answer, the accuracy of such feedback information is extremely important to us and the physician.

To understand the relation between our self-reported compliance rates and our memory ability, we asked you to perform a variety of memory tests in this study. In order to get an accurate measure of some types of memory, we asked you to (a) tear out the messy page from your questionnaire booklet and write the name of the questionnaire on the back, and (b) call the researcher in 20 minutes so that she could make an important phone call. The tasks were actually a planned portion of the experiment so that we could measure your memory for performing these tasks (just as if we had asked you to remember to take a medication when you saw it, or remember to take your next pill in 20 minutes). We apologize for giving you a cover story for these tasks, but this information is crucial for understanding how different parts of the memory system are used to remember our medications.

We also asked you to remember some everyday actions and to recall a text describing some medication instructions. We will examine the relation between adults' performance on all these different memory tasks and their self-reported medication taking behaviours.

In an initial study, we found that older adults' beliefs about their memory (in general) were a primary motivator for (a) using strategies to remember to take medications and (b) self-reported medication compliance rates. Perhaps, when the doctor asks us how our medication-taking is going, we base our reply on our general beliefs about our memory rather than on our specific memory for our

medications. The role of memory beliefs may be very important. Often, when health professionals address the topic of improving medication compliance in older adults, they point to educating adults about important information (i.e., the seriousness of the illness, the side-effects, dosage information). Although we agree that such education is crucial, our results suggest that older adults' beliefs about their memory ability should be addressed in such educational programs.

Again, we thank you for taking part in our study. We hope that the results of this work will be helpful for (a) furthering scientific understanding of memory changes across adulthood, and (b) creating comprehensive medication adherence programs to help some older adults remember to take their medications more accurately.

Please do not hesitate to ask us any questions about this study. We encourage and look forward to your input.

Thanks again!