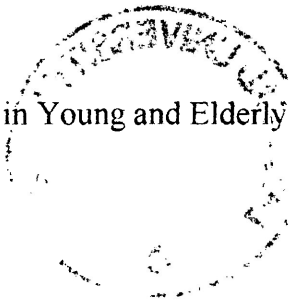
Running Head: Medication Compliance

Memory and Medication Compliance in Young and Elderly Adults



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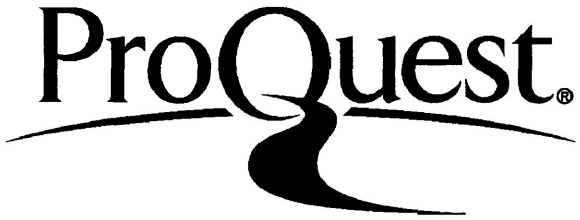

Abstract

Poor medication compliance can result in reduced therapeutic benefits and a need for additional medical services (Putnam et al., 1984). The American Association of Retired Persons (1984) estimates that older adults consume an average of 3 or more medications daily. Poor medication compliance in elderly adults may be due to a decline in cognitive abilities (Park & Kidder, 1996). The present study was conducted to determine if poor medication compliance among elderly adults is associated with declining cognitive abilities. Older adults were contrasted with young adults on (a) their ability to adhere to a complex, pseudo-medication regimen for 4 weeks, and (b) subjective ratings of their medication compliance. Growth curve analyses revealed no group differences in self-reported compliance or change in self-reported ratings over time. Older adults demonstrated better medication compliance, as well as greater improvement in compliance over the 4 weeks. The results suggest that healthy older adults can successfully adhere to a complex medication regimen. Thus, other factors besides cognitive ability may be implicated in poor medication compliance by elderly adults.

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Memory and Medication Compliance in Young and Elderly Adults

Medication compliance can be defined as using medication correctly, as prescribed by a physician. This includes taking medication at the right time, in the correct amount, and adhering to special instructions (Park &Kidder, 1996). Medication nonadherence, on the other hand, includes behaviours such as errors of commission (missing a dose), quantity errors (taking the wrong dose), time errors (taking at the incorrect time), and selective nonadherence (omitting doses entirely).

Medline, PsycLit, and Uncover were used to identify previous studies on medication compliance in the elderly. According to a substantial body of research, medication noncompliance is a major problem for older adults. Estimates of nonadherence rates among elderly adults are high. For instance, Kiernan and Isaacs (1981) estimated the rate of nonadherence to be 40%. Kendrick and Bayne (1982) reported even higher rates, ranging from 47% to 65%. Some estimates suggest that only 70 to 75% of prescribed medication is taken, regardless of the convenience of the dosing schedule (Cramer, Scheyer, & Mattson, 1990). Recently, research showed that 32 to 45% of older adults

do not adhere to their medication regimens (Isaac, Tamblyn, & McGill-Calgary Drug Research Team, 1993; Morrow, Leirer, & Sheikh, 1988). Similarly, Salzman (1995) has identified inappropriate drug discontinuation as a major problem for older adults. It is estimated that older adults will cease medication use prematurely in up to 40% of cases (Salzman, 1995).

Various reasons have been suggested for poor medication compliance. These range from human factor variables (e.g., difficulty opening the medication container) (Kendrick & Bayne, 1982), physician interaction style (Drury, Wade, & Woolf, 1976), patient embarrassment about their perceived level of noncompliance (Roth & Caron, 1978), and degree of social isolation (Schwartz, Wang, Sitz, & Goss, 1962). Furthermore, many older adults purposely omit medication doses (Morrel, Park, & Poon, 1989). A study by Cooper, Love, & Raffoul (1982) showed that 70% of medication nonadherence is intentional (Cooper, Love, & Raffoul, 1982). Common reasons for omissions include fear of being over medicated (Cooper et al., 1982; Hemminki & Hammarlund, 1975), and unpleasant side effects (Hemminki & Hammarlund, 1975; Ostrom, Hammarlund, Christensen, et al., 1985).

Poor medication compliance can seriously affect the quality of patient health care (De Geest, von Renteln-Kruse, Steeman, Degraeve, & Abraham,

1998; Dimatteo & DiNicola, 1982; Haynes, Taylor, & Sackett, 1979). Negative effects include reduced therapeutic benefit, and an unnecessary need for additional medical services (e.g., diagnostic evaluations, medications) (De Geest et al., 1998; Putnam, Finney, Barkley, & Bonner, 1994). This is a particular concern for the elderly population, as they consume approximately half of all prescription drugs (French, 1994; Swafford, 1997). Park (1992b) similarly noted that 34% of older adults are taking three or more prescribed medications daily.

It is important to note that the majority of cognitive aging studies used a cross-sectional design. As such, aging effects are identified by comparing subsamples that differ in age, but are assumed to be matched in all other aspects (Salthouse, 1982). Because of the fact that quasi-experimental designs prevent random assignment of study participants, the internal validity of the study may be threatened. In aging research, a major threat to internal validity is cohort effects (Schaie, 1988). Thus, age-related differences emerging from cross-sectional studies may be exaggerated.

Self-Reported Medication Compliance

Self-reported medication compliance may be described as "an estimate of one's memory ability within the particular memory domain of medication

taking" (Gould, McDonald-Miszczak, & King, 1997, p. 319). Self-reports are typically used by physicians and pharmacists to monitor and modify medication regimens. It has been suggested that up to two-thirds of patients might have their regimens adjusted incorrectly (Rudd, 1993). Some patients may be using higher doses of medication than required (Rudd, Byyny, Zachary, LoVerde, Titus, Mitchell, & Marshall 1989), and consequently are at an increased risk of suffering drug-related side effects (Rudd et al., 1989).

Self-reported compliance is generally regarded as a limited measure of adherence behaviour (McElmay, McCallion, al-Deagi, & Scott, 1997; Norell, 1981; Park & Kidder, 1996; Rickels & Briscoe, 1970; Roth, 1984). In a recent study by Straka, Fish, Benson, and Suh (1997), 67% of older adults were found to overestimate their self-reported compliance when monitored by a computerized Medication-Event Monitoring System (MEMS-4). Strecher, Becker, Clark, and Prasada-Rao (1989) state that the extent of accurate recall is probably less than two weeks. Beyond this time, the authors suggest that self-reports offer only "a simple estimate of average compliance, but little chance of an accurate, reproducible summary of specific doses taken versus missed" (p. 164).

Another limitation of self-reports is that patients often overestimate

their compliance behaviour (Norell, 1981; Rudd, 1990; Spector, Kinsman, Mawhinney, Siegel, Rachelsfsky, Katz, & Rohr, 1986). For instance, Haynes, Taylor, Sackett, Gibson, Bernholz, and Muckherjee (1980) reported that participants in their study overestimated their compliance by an average of 17%. Similarly, Fletcher, Pappius, and Harper (1979) found that 83% of the patients in their medication study claimed perfect compliance. However, only 2% of the participants achieved perfect compliance.

Although often inaccurate, self-reports are one of the best measures of compliance. Pill counts can conceal nonadherence by throwing away pills not taken. In addition, pill counts do not permit the measurement of incorrect self-medicating (e.g., taking two medications at once) or following special instruction (e.g., take pill with food) (Leirer et al., 1988). Clinicians' personal assessments of patients compliance are often unreliable (Caron & Roth, 1977; Mushlin et al., 1977). Direct measures such as blood and urine tests are costly and inconvenient to the patient (Leirer et al., 1988). In addition, blood and urine analysis provide no details about the pattern of nonadherence. For example, regarding drugs that clear the system quickly, a blood test yields steady-state levels that are not representative of the patient's typical compliance. Electronic pill dispensers are immobile, unnatural and disruptive

to the older adults' normal lifestyle. Thus, data collected in this fashion may not represent the typical adherence patterns of elderly adults.

Self-reports have the potential to be accurate. Strecher et al. (1989) report that many studies report high agreement between self-report and objective measures. Self-reports provide data that is often unattainable through biochemical or other independent techniques. In addition, they can yield a greater depth of information than is produced by other approaches.

Cognitive Factors Involved in Medication Compliance

Nonadherence rates among young and older adults are surprisingly similar (Morrel, Park, & Poon, 1989). However, cognitive factors play a more substantial role in medication compliance for older adults (Park, 1992b; Ruscin & Semla, 1996). Medication compliance can be better understood by examining the cognitive components of compliance. Park (1992b) has suggested that medication compliance consists of four major cognitive components. These include comprehension, working memory, long-term memory, and prospective memory.

Comprehension

Park (1992b) defines comprehension, as it relates to medication-taking,

as the ability to "understand the instructions presented on the individual prescription for taking the medication" (p. 469). Older adults are at a disadvantage regarding their comprehension and long-term memory abilities for unfamiliar medication (Park, Morrell, Frieske, & Kincaid, 1992). An important factor contributing to the poor medication compliance of older adults is their difficulty in understanding and remembering medication information (Morrel et al., 1990). Typically, inexplicit medication instructions are provided on the prescription bottle. These instructions are problematic for older adults due to the age-related decline in their comprehension abilities (Salthouse, 1982). Inexplicit instructions require that the patient make inferences about the medication-taking procedure (e.g., the exact time of day to take the medication), an ability that declines with age (Cohen, 1981). In a study by Morrell et al. (1989), the ability to comprehend medication instructions was compared for young and older adults. Participants were provided with prescription information in either a *highly organized format* or a *typical medication dispensing format*. Those in the *highly organized format* received prescription bottles that contained detailed information and a specific medication-taking schedule. Participants in the *typical medication dispensing format* were provided with prescription bottles labelled with inexplicit

medication information and received verbal instructions from a pharmacist on how to take the medication. Older adults exhibited substantial difficulty understanding medication information when it was presented in the *typical medication dispensing format*. However, both groups showed little difficulty understanding the information when it was presented in the *highly organized format*. These findings suggest that older adults can achieve similar compliance rates to younger adults. However, it is necessary that the medication instruction are detailed and do not require elderly adults to make inferences, or to rely on their comprehension abilities. Hultsch and Dixon (1983) similarly found that age differences in memory for medication information are less prominent when older adults are familiar with the medication regimen.

Prospective Memory

Prospective memory, remembering to do something in the future without being reminded, is particularly important for older adults in critical tasks such as taking medication and remembering appointments (Leirer, Tanke, & Morrow, 1994). Despite the importance of prospective memory, research has given little attention to it (Ceci & Bronfenbrenner, 1985; Harris, 1983).

Recent studies have examined the effects of age on prospective

memory. The results are inconclusive, with some studies showing that prospective memory declines with age (Cockburn & Smith, 1988; Dobbs & Rule, 1987), while others show little effect (Sinnott, 1986; West, 1988) or a beneficial effect (Martin, 1986; Moscovitch, 1982). Craik (1986) proposed that age deficits in prospective memory can be attributed to a decline in self-initiated retrieval processes. Since prospective memory requires self-initiated retrieval, this task should be particularly difficult for the elderly as it involves memory for activities to be performed in the future. Einstein and McDaniel (1990) note that there are varying degrees in which prospective memory requires self-initiated retrieval, and suggest that the level of self-initiated retrieval is dependent on whether the task is event-based or time-based. For an event-based task, the future action is done when an external cue (e.g., a specified word) prompts remembering. A time-based task requires the individual to remember to respond at a specified time, without the benefit of a specific external cue. Thus, one would anticipate that an event-based prospective memory task would not produce large age-related effects, due to the presence of external cues that serve as a precursor to retrieval. Findings by Einstein & McDaniel (1990) support this theory, as they failed to find age differences on event-based prospective memory tasks. However, they did find

marked deficits on retrospective memory tasks.

Prospective memory comprises two factors, a prospective component and a retrospective component (Einstein Holland, McDaniel, & Guynn, 1992). The prospective memory component requires that the target event spontaneously evoke one's memory. The retrospective component involves remembering what is to be done, and appears to parallel retrospective cued-recall tasks when the prospective task is event-based (Einstein et al., 1992). Once an external cue (e.g., a specified word) triggers prospective memory, the retrospective portion of the task must be recalled (e.g., write one's name). Past studies may have been unable to find age differences in prospective memory because the retrospective portion of the prospective task was too simple (Einstein et al., 1992). More recent analyses show that young adults were better than elderly adults at complex prospective memory tasks because of the increased difficulty of the retrospective memory component.

Research shows that large age differences in time-based prospective memory tasks exist due to the significant amount of self-initiated retrieval (Einstein, McDaniel, Richardson, Guynn, & Gunfer, 1995). Findings from Einstein et al.'s (1995) research lends support to this theory. They provided evidence that self-initiated retrieval was necessary for successful completion of

a time-based prospective memory task.

Regarding medication-taking, the prospective component appears to be a time-based retrieval task, as medications are to be taken on a time-based schedule (Park & Kidder, 1996). Due to the high self-initiated processing demands of time-based tasks, one would expect that medication-taking would be a difficult task, especially for older adults (Park & Kidder, 1996). It has been suggested that specific techniques (e.g., linking medication taking to meals) could be used to transform a time-based task into a simple event-based task (Maylor, 1990). However, this may not be possible with complex medication regimens (Kruse, Eggert-Kruse, Rampmaier, Runnebaum, & Weber, 1991; Norell, 1980). It has been well established that as the complexity of medication regimens increase, compliance decreases (Kruse, et al., 1991; Norell, 1980; Alfredsson & Norell, 1981; Hermann, 1973). As the number of medications increase, an increased memory load results. When an older adult is taking many medications, coming up with many routine events that can be linked to medication-taking is difficult. In addition, it becomes increasingly difficult to perform their routine events at evenly spaced times throughout the day (in accordance with the medication regimen).

Kruse, Eggert-Kruse, Rampmaier, Runnebaum, and Weber (1991)

found that as the number of doses per day increases, adherence will decrease. Norell (1980) found that the proportion of missed doses for a medication taken three times were higher than for a twice daily regimen. It also was shown that timing the doses for a three-times daily regimen (Alfredsson & Norell, 1981) is more problematic than timing doses for a twice daily regimen (Hermann, 1973). Therefore, it is plausible that each additional medication would provide an increased memory load for the individual, while the high number of doses would make it difficult to come up with routine events that are equally spaced (Park & Kidder, 1996).

Retrospective Memory

Deficits in the domain of retrospective memory are well documented (Hultsch & Dixon, 1990; Smith, 1996). Simply put, retrospective memory is memory for past events (e.g., remembering someone's name) (Einstein & McDaniel, 1990). Retrospective memory is very important to medication-taking as individuals must monitor the total number of medications in their regimen (Park & Kidder, 1990). The retrospective component of medication compliance becomes increasingly important considering the complexity of information associated with each medication (e.g., dosages, time of day, side effects) (Park & Kidder, 1996). For instance, Park and Kidder (1996) have

found it is not uncommon for elderly adults to be taking eight or more medications. Salthouse (1991) suggests that an important factor to consider is that cognitive decline is particularly pronounced from 70 years of age and beyond. Furthermore, the incidence of cognitive impairement in older adults (65 years of age and older) ranges from 3% to 20%, depending on the measurement and criteria used to assess cognitive functioning. Thus, older adults may not have the appropriate cognitive resources regarding the retrospective facet of medication compliance (Park & Kidder, 1996). Retrospective memory consists of long-term memory and working memory (Park & Kidder, 1996).

Long-Term Memory. Broadly defined, long-term memory is information retained for extended intervals of time. This time ranges from 30 seconds to the remainder of an individual's life span (Fernald & Fernald, 1985). Salthouse (1991) explains that long-term memory consists of an encoding, storage, and retrieval phase. The encoding phase refers to a range of processes, beginning with sensing and perceiving information, to elaborating and organizing incoming information with existing knowledge. Next, the storing of information, from the time of initial input until the information is later recall, is known as the storage phase. Lastly, the retrieval phase involves

accessing previously encoded and stored information for current processing.

Research shows that long-term memory abilities decline with age (Light & Anderson, 1983; Albert, Heller, & Milberg, 1988; Salthouse & Mitchell, 1989). The earliest work on long-term memory, as it relates to medication-taking, was conducted by Ley and colleagues (Ley, 1979; Ley, Whitworth, Skilbeck, Woodward, Pinsent, Pike, Clarkson, & Clark, 1976). In their 1976 study, Ley et al. discovered that as age increased, individuals were more likely to forget medication information.

Older adults appear to be at the greatest disadvantage in recall abilities when they have limited retrieval information (Craik, 1977). In medication-taking situations, older adults are required to use their long-term memory abilities to recall medication information. Typically, medication instructions are explained by a pharmacist when the medication is initially dispensed. After the initial instruction, patients are forced to rely on the limited information available on the prescription bottle. When difficulties are experienced in recalling medication instructions, elderly adults must compensate for deficits in long-term memory. Thus, older adults must rely on previous medication-taking instances to recall successfully how to take the medication correctly. In addition, they are forced to make inferences about the medication taking

procedure (Cohen, 1981). Unfortunately, both self-generated "reconstructive activities" and inferential abilities have been shown to decline with age (Craik, 1977; Cohen, 1981).

Elderly adults are also at a disadvantage when attempting to recall novel information. Thus, older adults may experience substantial difficulty remembering new and unfamiliar medication. Park, Smith, Monell, Puglisi, and Dudley (1990) state that older adults also have difficulties organizing and integrating information in long-term memory. This difficulty is exacerbated when the amount of presented information is increased (Cerella, Poon, & Williams, 1980). Many older adults follow complex medication regimens (Park & Kidder, 1996) and due to limitations in their recall abilities (Morrel et al., 1990), their compliance is often poor.

A common technique used for measuring retrospective memory for medication taking is subject performed tasks (SPTs). These are activity-specific long-term memory tasks that involve remembering actions performed in everyday life (West, 1986). SPTs are discrete, one-step actions (e.g., fold paper, touch nose) that participants are asked to perform and later recall (McDonald-Miszczak, Hubley, & Hultsch, 1996).

Cognitive aging research (e.g., Backman, 1985, Backman & Nilsson,

1985; Norris & West, 1993) shows that the age differences typically observed in free recall can be minimized by using SPTs. The multimodal nature (involving vision, hearing, touch, movement), and richness (involving the use of concrete, real-life objects) of SPTs support encoding by older adults (Backman, 1985). The characteristics of SPTs are inherent in medication-taking behaviour. For example, medication-taking involves using concrete, real-life objects (e.g., prescription bottles, pills) and the use of multiple senses to take the medication (e.g., pick up prescription bottle, put pill in mouth). Backman and Nilsson (1984) suggest that the multimodal nature and richness of SPTs may allow elderly adults to compensate for age-deficits in recall abilities. Interestingly, young adults do not experience additional encoding when using SPTs (Backman, 1985). Rather, young adults spontaneously use strategies that work equally well on less rich verbal stimuli such as sentences and words (Backman, 1985).

Working Memory. Working memory is important to medication-taking, as it is necessary for the integration of medication instructions. Craik and Jennings (1992) refer to working memory as "the processes and structures involved in simultaneously holding information in mind and using that information (often in combination with further incoming information) to solve

a problem, make a decision, or learn some new concept" (p.56). Working memory is essential for organizing medications in a regimen, and correctly timing the respective doses (Park, 1992b).

Working memory is implicated in medication compliance, because, when several medications comprise an individual's regimen, an increased demand for short-term storage and processing of medication information results. Moreover, older adults are likely to be following complex, multiple drug regimens (Morrel et al., 1989). Additionally, research shows that older adults have difficulty adhering to complex medication regimens (Einstein, et al., 1992). As a result, older adults age-related decline in working memory abilities is further taxed by the increased complexity of the task. Thus, when older adults use organizational devices (e.g., pill organizers) that support working memory and assist in simplifying complex medication regimens, adherence improves (Park et al., 1992).

Specifically, age-related differences in working memory are related to age decrements in the capacity of storage, the efficiency of processing and in the combination of storage and processing (Babcock & Salthouse, 1990; Dobbs & Rule, 1989; Salthouse, 1991). However, Salthouse and colleagues (Salthouse & Babcock, 1991; Salthouse, 1991; Salthouse, 1992a; Salthouse &

Kersten, 1993) have shown that the major factor concerning age differences in working memory is efficiency of processing speed. In various studies using different samples and different measures for working memory and processing speed, statistical controls showed that 71% to 96% of the age-related variance in measures of working memory is shared with measures of processing speed. Thus, it appears that older adults are slower than young adults at encoding information or activating information. As such, older adults may take longer to encode medication information when learning the regimen. In addition, older adults will likely exhibit more difficulty activating medication instructions during medication-taking instances.

Complexity of Medication Regimens

The complexity of a medication regimen refers to "both the number of different pills required each day and the number of doses prescribed for each pill" (Boczowski & Zeichner, 1985, p. 10). Complexity is an important variable in explaining medication compliance (Lipton & Baird, 1993; Hulka, Kupper, Cassel, & Efird, 1975; Kruse et al., 1991), and may be the variable most consistently related to medication noncompliance (Boczowski & Zeichner, 1985). Medication-taking studies typically show a negative

relationship between patient compliance and the number of medications taken by the patient (Darnell, Murray, Martz, & Weinberger, 1986; Neely & Patrick, 1968). For example, Kiernan and Isaacs (1981) found that older adults taking one tablet daily had a 94% compliance rate. However, when the dosage was increased to three times daily, the compliance rate fell to 25%. A similar pattern was found by Kendrick and Bayne (1982). They found a 65% compliance rate for patients using one medication. Study participants taking four medications complied 54% of the time, while individuals using six medications dropped to a 47% compliance rate. These findings suggest that more complex medication regimens are associated with poorer compliance.

The ability to follow complex medication regimens is of particular concern for the elderly, as estimates suggest that 25% of older adults consume three or more medications daily (American Association of Retired Persons, 1984). Another factor complicating the problem is that older adults experience a decline in cognitive abilities as they age (Park & Kidder, 1996). This cognitive decline increases risk for noncompliance when medication regimens are complex (Park & Kidder, 1996). Furthermore, following complex medication regimens may cause older adults to experience an "information overload" effect when they are presented with large amounts of written and

verbal prescription information (Ascione & Shimp, 1984). Morell et al. (1989) found that when few medications comprise the medication regimen (i.e., a low task demand), older adults are more likely to adhere to the medication regimen. However, older adults are typically in polypharmacy (multiple drug) situations, which places them at increased risk for noncompliance (Morrell et al., 1989).

The Present Study

The purpose of the present study was to examine the self-reported medication compliance and actual compliance behaviour in young and older adults. The main questions addressed by the present study included: (a) Do young and older adults differ in their cognitive abilities? (b) Will young adults exhibit more change than older adults in self-reported and actual compliance over a four-week period? (c) Is performance on memory tests associated with medication compliance over a 4 week period? (d) Will young adults show better recall of the medication regimen when compared with older adults?

Cognitive factors, particularly working memory, long-term memory, and prospective memory, are believed to play a substantial role in medication compliance (Park, 1992). Processing speed may also be an important factor in determining medication compliance (Salthouse, 1991). Research consistently shows that older adults show age-related decline in memory ability (ref). As

such, the initial hypothesis is as follows:

1. The young group will show better event-based prospective memory, time-based prospective memory, working memory, and faster speed of processing when compared with older adults.

It is well-documented that older adults show age-related differences in retrospective memory ability (Hultsch & Dixon, 1990, Smith, 1996). However, Backman and Nillson (1985) suggest that using an activity-specific retrospective memory task will reduce age differences in retrospective memory ability. As such, it is hypothesized that:

2. No differences will emerge between young and older adults on retrospective memory abilities when an activity-specific task is used (e.g., subject-performed task).

Another important factor interfering with proper medication compliance is the complexity (i.e., daily medications and doses) of the medication regimen (Lipton & Baird, 1993; Kruse et al., 1991). Since older adults are typically following complex medication regimens, they are at an increased risk for noncompliance (Morrell et al., 1989). Thus, the following is hypothesized:

3. The elderly group will perceive the medication regimen to be more

complex than the young group.

Research shows that young and older adults are often inaccurate in their self-reported medication compliance (Strecher et al., 1989). However, because young adults are at the peak of their cognitive abilities (Salthouse, 1991), they may demonstrate more accurate self-reporting. This may be due, in part, to their superior ability to recall past medication-taking episodes. Moreover, as the young adults become more accustomed to recalling specific past medication-taking episodes, they will likely show greater improvement in self-reported compliance over time. As such, it is expected that:

4. The young group will show greater improvement in self-reported compliance when compared with the elderly group during the four-week regimen.

5. The young group will rate their compliance higher than the elderly group.

It is well-established that comprehension, prospective memory, retrospective memory, and working memory are crucial factors in successful medication compliance (Park & Kidder, 1996). Again, young adults consistently show better functioning in all these areas (Salthouse, 1991). Moreover, as young adults continue to follow the regimen, the medication-

taking routine will become better encoded in their memory. As such, they will show greater improvement in medication compliance over time.

6. The young group will show greater improvement in actual compliance when compared with the elderly group during the four-week

7. The young group will show better actual compliance when compared with the elderly group.

Research shows that patients often overestimate their self-reported compliance behaviour (Rudd, 1990; Spector et al., 1986). Thus, it is anticipated that:

10. Self-reported compliance ratings for young and older adults will be higher than their actual compliance scores.

Research consistently shows that long-term memory abilities decline with age (Salthouse & Mitchell, 1989). Thus, it is hypothesized that:

11. The young group will rate their recall of the medication regimen higher than the elderly group.

12. The young group will recall more medication information when compared with the elderly group.

Method

Participants

Sixty-four participants were involved in the study. The participants included 32 young adults (M = 22.53, SD = 4.55) and 32 elderly adults (M = 70.50, SD = 8.09) who were not taking prescribed medications at the onset of the study. The data of two young adults was excluded due to missed sessions. Two elderly adults voluntarily withdrew from the study. Young adults were recruited from introductory psychology classes at Lakehead University in Thunder Bay. Student participants received three percentage points toward their final grade in introductory psychology. Elderly participants were recruited from various settings, including seniors' clubs in the Thunder Bay region, the volunteer pool from the Seniors' Abilities and Life Tasks (SALT) project, and the Lakehead University registration list for students aged 60 and over. Elderly students enrolled in Introductory Psychology also received three percentage points toward their final grade, while the other elderly participants received $20 for their participation. All elderly participants lived independently (i.e., either alone or with their spouse).

Procedure

Participants attended five sessions over a four-week period. The

experimenter met with each participant individually. The first visit was held at Lakehead University and lasted approximately one hour. Participants completed an Informed Consent sheet (Appendix 14), the Personal Information Questionnaire (Appendix 1), the Centre for Epidemiologic Studies-Depression Scale (Appendix 2), the Metamemory in Adulthood Questionnaire (Appendix 3), and the Knowledge of Medication Questionnaire (Appendix 8). Next, participants completed several cognitive tasks including the Digital Symbol Subtest of the Wechsler Adult Intelligence Scale-Revised Edition (Appendix 4), the Sentence Construction task (Appendix 6), Subject Performed Tasks (Appendix 7), and the Event-Based Prospective Memory task (Appendix 5). The experimenter explained that participation in this study would involve following a four-week pseudomedication regimen, designed to mimic that of an older adult. Participants were asked to pretend that they were afflicted with four illnesses that commonly affect older adults (Hypertension, mild Osteoporosis, Pulmonary Disorder, and Insomnia), to use five pseudomedications (Adalat, Diltiazem, Calcium, Vitamin D, Restoril) and two inhalers (Ventolin, Atrovent) to help control their medical problems. Participants were asked to maintain a patient/pharmacist style relationship with the experimenter to provide a more realistic nature to the study and thus a more

accurate measure of compliance. The experimenter explained the purpose of taking each drug, and gave participants an information sheet with more detailed descriptions of each medication. The information sheet also provided the amount to be taken, the number of times per day, which medications were to be taken together, special instructions associated with the medication, and the side effects.

For the purposes of this study, no medication was ingested nor were any inhalers used. Taking medication involved participants removing a bead from a labelled pill bottle and placing it into a small container provided by the experimenter. The container was dark-coloured with a sealed lid to prevent participants from seeing how many beads and stickers they had taken. Puffer use was recorded by giving participants a sheet of stickers. Participants showed mock usage of the inhaler by removing a sticker from the left pocket in the "puffer booklet" and placing it in the same container as the beads.

After explaining the medication regimen, the experimenter discussed the importance of recording results honestly and accurately. Two weeks of medication was provided. The first week of medication was to be used immediately, while the second week of medication was enclosed in an envelope to be opened at the beginning of Week 2. In addition, participants

were given side effect information for each medication, and a calendar listing all future appointments.

The second session consisted of a 30 minute telephone call. Participants were asked to complete two questionnaires. The Refill Questionnaire (Appendix 9) assessed medication-taking behaviour and other related factors. For instance, participants were asked to rate their medication compliance, indicate how complex they perceived the regimen to be, and to report specific strategies they used. Next, participants were asked to open the envelope labelled "Confidential Questionnaire" and to complete the enclosed questionnaire (Appendix, 10). This measure assessed voluntary noncompliance and the perceived importance of the study. Upon completion, participants were told to seal it in the envelope provided. Participants were informed that the envelope would not be opened until the end of the study. Participants were requested to open the envelope labelled "Week 2 medications" and to use the enclosed pill bottles for the second week of the medication regimen. In addition, participants were told that the experimenter would be out of town one day before the week three meeting. As such, the experimenter requested that participants phone to confirm the meeting. Participants were instructed to leave a message on the lab answering machine between 8:00 a.m. and 12:00

p.m.. This served as the Time-Based Prospective Memory task (Appendix 11).

The third visit took place at the participants home. This meeting was also 30 minutes. Participants completed a second Refill Questionnaire and Confidential Questionnaire that they again sealed in an envelope. The experimenter provided new pill bottles and refills of medication for the third and fourth weeks. Participants could begin the third week of the regimen at the end of the meeting, while material for the fourth week was given in an envelope, to be used one week later. A Confidential Questionnaire for Week 4 was provided in a separate envelope. The experimenter collected unused medications from Week 1 and Week 2, and the Confidential Questionnaires.

The fourth session was identical to the Week 2 telephone interview. Participants were again asked to complete the Refill Questionnaire and the Confidential Questionnaire. Next, they were asked to begin their fourth week of medication. Before finishing the session, participants were reminded to bring all unused medications and completed questionnaires to the final interview at Lakehead University.

The final visit took place at Lakehead University and was approximately 30 minutes. Participants received the Refill Questionnaire and the Confidential Questionnaire. They also completed a Rating Questionnaire

(Appendix 12) which assessed knowledge of the medication regimen (e.g., the number of times per day medication was required, the appropriate dose, etc.). A Recall Questionnaire (Appendix 13) (consisting of the same questions as the Rating Questionnaire) was given, and participants were asked to provide the written answers to these questions. Participants were debriefed and thanked for their participation.

Materials

Personal Information Questionnaire (Appendix 1). A 32-item Personal Information Questionnaire was developed for this study. The questionnaire assessed sociodemographic information, general health (e.g., hearing, eyesight, frequency of visits to doctor), medical conditions (e.g., heart condition, asthma), lifestyle questions (e.g., engagement in social activities, alcohol use) and use of prescribed medication (present and past).

The Digit Symbol Subtest of the Wechsler Adult Intelligence Scale-Revised Edition (Appendix 3). The Digit Symbol Subtest of the Wechsler Adult Intelligence Scale-Revised Edition (WAIS-R; Wechsler, 1987) is a speed of processing task. It contains nine symbols paired with nine digits. Participants are provided with the matched samples and required to fill in as many symbols as possible under the corresponding number within 90 seconds.

Participants receive one point for each correct item. The maximum score is 93 points, with higher scores reflecting greater speed of processing ability. Reliability ratings using the test-retest method ranged from .73 to .86 (Wechsler, 1987). A factor analysis rating of .85 was found between the WAIS Full-Scale IQ and the Stanford-Binet.

The Metamemory in Adulthood Questionnaire (MIA, Appendix 4). The Metamemory in Adulthood Questionnaire (MIA; Dixon & Hultsch, 1983a, 1983b) consists of 108 items designed to measure participants' awareness of their memory functioning. The items are scored on a 5-point Likert scale ranging from "agree strongly" to "disagree strongly" and "always" to "never". Higher scores on these scales represent heightened awareness of individual memory functioning. Items 15 and 38 are reverse scored. Three of the seven scales, namely the Capacity, Anxiety, and Strategy scales were selected for use in this study. The Capacity scale measures memory self-efficacy (e.g., I have no trouble keeping track of my appointments). The Anxiety scale is a measurement of anxiety concerning memory-related activities (e.g., I have difficulty remembering things when I am anxious). The strategy scale assessed the use of memory strategies in everyday life. Two strategy subscales, internal and external strategies, were derived from the MIA Strategy scale (Dixon &

Hultsch, 1983b). External strategies involve physical changes in the environment (e.g., keeping a list or making note of important dates), while internal strategies require personal mental activity (e.g., using mnemonics to help recall something). Internal consistency analysis ranges from .81 to .86 (Hultsch et al., 1987; Dixon & Hultsch, 1983b) for the Capacity subscale, .83 to .87 (Dixon & Hultsch, 1983b; Hultsch et al., 1987) for the Anxiety subscale, and .82 to .86 (Hultsch et al., 1987; Dixon & Hultsch, 1983b) for the Strategy subscale. Some evidence of predictive validity has been demonstrated (Dixon & Hultsch, 1983a; Dixon et al., 1986).

Event-Based Prospective Memory Task (Appendix 5). A single event-based prospective memory task, presented as a cover-story, was designed for this study. Participants were told that printing errors may have occurred in their questionnaire booklets, resulting in blurry, unreadable pages. They were instructed to remove the blurred pages from the booklet if they encountered any. On these pages, they were told to record both their name and the name of the questionnaire in the top right-hand corner. A blurred page was intentionally placed in each "Memory Questionnaire". A score of zero was given if the participant did not remove the blurred page from their questionnaire booklet. In cases where the blurred page was removed, but the

participant forgot to write their name and the name of the questionnaire in the top right-hand corner, a score of 0.5 was assigned. A full score of one point was given if the participant tore out the blurred page, and wrote their name and the name of the questionnaire in the top right-hand corner.

Sentence Construction Task (Appendix 6). The Sentence Construction task (Hultsch, Hertzog, & Dixon, 1990) is a verbal measure of working memory. Participants are shown a series of sentences and asked to read these sentences aloud, and at their normal reading pace. Each sentence is on a single piece of paper. In each sentence, one word is underlined and printed in capital letters. The participant is instructed to remember this word while reading the sentence. When the participant has finished reading the sentence, the experimenter turns the page, and the participant reads the next sentence. The participant is required to remember the first target word, while encountering additional target words in upcoming sentences. At the end of the section, participants are asked to report, in order, the target words from each sentence. The target words are ordered so that they create a sentence. In total, four sets of sentences produce new sentences that are 3, 4, 5, and six words in length. Three sentences of each length are included, totalling 12 items. Two initial sample items are included to ensure that the participant understands the task.

One point is given for the exact recall of the sentence. If the participant fails to recall less than two sentences correctly in a given section, no points are awarded. The maximum score that can be obtained is 12.

Subject Performed Tasks (SPT, Appendix 7). Subject Performed Tasks (SPT's) is an activity-specific retrospective memory task, introduced by Cohen (1981). SPTs involve memory for actions performed in everyday life. The experimenter verbally presents 35 action pairs to the participant, one item at a time. An action pair consists of two words presented together, which describe a common activity (e.g., cross legs, shuffle cards, raise eyebrows). After the presentation of each action pair, the participant is required to repeat the item aloud, and then perform the action. Participants receive a 10-second time-delay between each item, to allow for further encoding of the action pair. At the conclusion of the list, participants are informed that they will receive seven minutes to record as many action pairs as possible. Before presenting the list of SPT's, participants are asked to make a prediction regarding the number of action pairs they expect to recall. This is known as a global prediction task. Participants are required to select a number between one and 35, with 35 representing a perfect score. This task was scored using three different methods. One scoring method involved assigning a single point for each

correct pair, with a maximum score of 35. A second method involved allotting a point for each word recalled correctly, with a maximum score of 70. For the third scoring method, a single point was given for each correct word, while also allowing for the inclusion of synonyms. The maximum score that could be achieved with this method is 70.

Knowledge of Medication Questionnaire (Appendix 8). The Knowledge of Medication Questionnaire was developed for this study. This 61-item measure was designed to assess the participant's prior knowledge of the medications used in this study. Sample items include "Have you heard of a medication called Adalat?", and "Do you know how many times daily this medication is to be taken?". This questionnaire served as a screening instrument as prior knowledge of the medications used in this study could potentially influence participants' compliance and recall.

Refill Questionnaire (Appendix 9). A Refill Questionnaire was developed to monitor the medication-taking behaviour and other miscellaneous factors that could potentially influence compliance (e.g., self-rated compliance behaviour, perceived complexity). Sample items included "How would you rate your compliance with your medication regimen over the last week?", and "How complex did you find the medication regimen?". The

Refill Questionnaire was administered at the end of each week.

Confidential Questionnaire (Appendix 10). A 4-item Confidential Questionnaire was developed as an extension of the Refill Questionnaire, to be completed at the end of each week. Participants were informed of the confidential nature of this questionnaire, and asked to seal it in an envelope that would be opened by the experimenter at the conclusion of the study. This questionnaire assessed voluntary noncompliance (e.g., How many days or parts of days, did you choose not to take your medication . . . ?), and perceived importance (e.g., . . . how important is it for you to remember to take your medication correctly for the purposes of this study?).

Time-Based Prospective Memory Task (Appendix 11). A time-based prospective memory task (presented as a cover story) was assigned for this study. During the second session (a telephone interview), participants were reminded that the experimenter would phone one day before the scheduled meeting to confirm the upcoming session. However, regarding the next meeting (session three), the experimenter was to be out of town one day before the session and would be unable to phone and confirm the meeting. Therefore, the participant was asked to phone the lab at a predetermined time (i.e., between 8:00 a.m. and 12:00 p.m.). Participants were also instructed to leave a

message stating whether they could attend the upcoming meeting. The experimenter emphasized that phoning during the predetermined time was necessary, as the answering machine would only be on at this time (after which it would be turned off due to testing in the lab). Participants that did not phone the lab, or who phoned outside the predetermined time were assigned a score of zero. Those who telephoned during the predetermined time received a score of one.

Rating Questionnaire (Appendix 12). The 6-item Rating Questionnaire was developed for this study. Participants were asked to rate their recall regarding several key facets of medication-taking. Sample items include "Do you remember what each specific medication is designed to treat?", and "Do you remember the side effects associated with each medication?". Participants indicated their responses to each question with a percentage rating (ranging from 0 - 100).

Recall Questionnaire (Appendix 13). A 6-item Recall Questionnaire was developed for this study. This 6-item scale was identical to the Rating Questionnaire with the exception that responses are required in written form.

The Centre for Epidemiologic Studies - Depression Scale (CES-D, Appendix 2). The Centre for Epidemiologic Studies - Depression scale (CES-

D; Radloff, 1977) is a 20-item questionnaire used to identify depressive symptomatology. The items are scored on a 4-point Likert scale ranging from "rarely or none of the time" to "most or all of the time." Higher scores on these scales reflect more depressive symptomatology. Items 4, 8, 12, and 16 are reversed scored. Sample items include "During the past week my sleep was restless," and "During the past week I felt sad." In the present study, the CES-D was used as a screening instrument to identify participants with high scores in depressive affect, as depression may contribute to inaccurate prediction or recall scores by the participant. Internal consistency has been demonstrated for this measure.

Results

Preliminary Analyses

The groups were compared on several potential extraneous variables, such as mood, demographics and beliefs about one's memory (see Table 1). The presence and severity of a depressed mood at the initial interview were compared between young and older adults to rule out the influence of current levels of depression. Both the young and elderly adults showed negligible depressive symptomatology. Next, the two groups were compared on beliefs about their memory. Young and older adults showed similar levels of anxiety

regarding their memory, self-efficacy, and internal strategy use. However, the young group reported higher incidences of external strategy use when compared with older adults, t (2, 58) = 2.98, p = .004, r = .36.

The groups were similar on most personal variables including number of daily social activities, number of visits to the doctor in the past 12 months, number of prescribed medications used in the last two years, and the use of hearing and vision aids. Young and elderly adults generally rated their overall state of health as *good* or *very good*. However, the two groups differentiated when a comparison was made regarding personal perceptions of their overall state of health with other people their age. Older adults rated their overall state of health higher than younger adults, t (2, 58) = 3.89, p = .000, r = .46. Prior knowledge of the medications used in the study was also assessed. No group differences were found involving prior medication knowledge. Both groups reported having very limited knowledge of the medications used in the study.

Group Differences in Memory Abilities

Young and older adults were compared on several types of memory, including (1) event-based prospective memory, (2) time-based prospective memory, (3) retrospective memory, (4) working memory, and (5) speed of processing. First, regarding event-based prospective memory, the young group

showed better recall on the event-based prospective memory task than the elderly group, t (2, 58) = 2.52, p = .015, r = .31. Second, young and older adults were tested on a time-based prospective memory task. Contrary to the hypothesis, no significant differences emerged between the two groups. Third, both groups were compared regarding retrospective memory ability. As anticipated, the young adults exhibited better retrospective memory performance when compared with the older adults, t (2, 58) = 3.71, p = .000, r = .44. Fourth, differences in working memory ability were examined. Contrary to the hypothesis, no group differences were demonstrated between the two groups. Fifth, young and older adults were compared on their speed of processing ability. It was expected that the young adults would exhibit superior speed of processing ability. As hypothesized, the young group demonstrated faster speed of processing than the older adults, t (2, 58) = 5.70, p = .000, r = .60.

Group Differences in Perceived Complexity and Perceived Importance

Young and older adults were asked to rate their perceptions of the complexity of the medication regimen. Although it was hypothesized that the young adults would rate the regimen as less complex, no significant group differences emerged. However, the finding did approach significance, t (2, 58)

= 1.95, p = .056, but not in the expected direction. Contrary to the hypothesis, the young adults rated the medication regimen as more complex than the older adults.

Participants were also asked to rate how important they believed it was to follow the medication regimen in the study. The young adults perceived the task to be less important than the older adults, t (2, 58) = -4.22, p = .000, r = .49.

Growth Curve Analyses

Common techniques used for analysing longitudinal data (e.g., zero-order correlations, t-tests, analysis of variance) can provide an incomplete picture of the data. The above statistical techniques are also limited to analysing two waves of data. This can present an incomplete picture of the data. In samples where large differences in development exist between individuals, examining only two mean values may distort the picture of change that emerges over time. As such, the focus on associations between initial measurements and final outcomes is inaccurate and likely unreliable, as change over time is not accounted for. Following individual time paths is the best measurement of individual change (Karney & Bradbury, 1996).

Growth curve analysis is a method of approaching multiwave data that

offers flexibility, while providing a clear focus on continuous processes of individual development. Growth curve analyses consist of two stages. In the first stage, the repeated-measures data for each individual are used to estimate the trajectory (i.e., slope and intercept) of each individual's dependent variable scores over time. The trajectory is calculated by regressing the dependent variable onto times of measurement. As a result, the slope (an estimate of the rate of linear change in the dependent variable score over time) and intercept (the expected value of the dependent variable score when time equals zero) provide an estimate of the trajectory of change over time. Thus, multiple waves of data are reduced to two parameters, slope and intercept, and an error term to summarize the observed trajectory for each person.

In the second stage of growth curve analysis, the parameters of the individual trajectories (i.e., growth curves) are treated as outcome variables to be explained by other contextual variables in a between-subjects analysis. For example, in the present study, the slope and intercept values for the dependent variables (self-reported compliance and actual compliance) become the dependent variables. Statistical analyses are then performed using the independent variable (group), and the new dependent variables (slope and intercept values).

Regarding the present study, the longitudinal changes in the dependent variables, self-reported compliance and actual compliance, can be assessed by examining the trajectory over time of each participant's dependent variable scores. To achieve this, growth curve analysis was used to examine and describe the longitudinal trajectories.

The first step in growth curve analysis is to learn where the trajectories of the dependent variable begin. The starting point for the slope trajectory is the intercept, which is the expected value of a participant's dependent variable score before the beginning of the study. Since a prior measurement of medication compliance does not exist for these participants, creating an intercept value was necessary. This was accomplished by centering the intercept value in the middle of the four measurement periods and labelling it as time zero. The intercept can now be interpreted as the average value of an individual's dependent variable across the duration of the study (Karney & Bradbury, 1996).

Age Group Differences in Levels of Compliance

Self-reported compliance intercept values (see Table 2) for the young and elderly groups were then compared. Growth curve analysis revealed no significant difference in estimated intercept scores, t (2, 58) = -1.69, p = .097,

n.s., $r = .22$.

Actual compliance intercept values (see Table 2) were also compared for the two age groups. A significant difference in actual compliance intercept values emerged between young and older adults, $t\ (2, 58) = 2.33$, $p = .02$. Unexpectedly, the elderly participants had a higher actual compliance intercept value when compared with the younger participants, $r = .29$. This finding demonstrates a significant difference in intercept values between the young and elderly group.

Change in Compliance Over Time

The next step in the analyses involved examining how self-reported compliance and actual compliance scores changed over time. As for self-reported compliance, the slope trajectories (see Table 3) for young adults decreased an average of 1.26 points in self-ratings each week from the initial starting point (see Figure 1). Conversely, the elderly participants increased an average of 0.34 points each week from the initial intercept value (see Figure 2). The average slope of the population, however, can be misleading concerning the variability among individual scores. The low average slope value shows that little variability exists among the individual estimated slopes. In actuality, the individual estimated slopes range from -27.90 to +19.00 for the younger

adults, and from -6.50 to 13.50 for the elderly adults. Clearly, wide variability is present among individual scores. Some younger adults declined nearly 28 points in self-reported compliance ratings between each phase of measurement, while others increased as much as 19 points. Similarly, some older adults declined as much as 6.5 points, while others improved up to 13.5 points.

Due to the wide range of scores in self-reported compliance slope estimates, the significance of the average slope is questionable. To test the significance of the average slope, the standard error was used to construct a 95% confidence interval. Confidence intervals ranged from +1.68 to -4.20 for the young participants, and from +1.91 to -1.23 for the elderly participants. Results showed that the estimated average slope did not differ significantly from zero for either the young or elderly groups. This finding demonstrates that, overall, neither group exhibited a significant change in self-reported compliance ratings across the four weeks.

Regarding the change in actual compliance scores over time, the slope trajectories (see Table 3) for the young group showed an average decrease of 2.64 points each week from the initial starting point (see Figure 3). On the other hand, elderly participants increased 0.22 points each week (see Figure 4). Taken together, these results show that the performance of younger adults

declined, while the elderly participants improved marginally over the four weeks. More specifically, the young group committed an average of 2.64 additional medication mistakes (i.e., missing a prescribed medication dose or taking an extra dose) each week. As for the elderly group, they committed 0.22 fewer medication mistakes with each passing week. Again, the average slope may not represent the individual slope value. As such, looking at the range in individual estimated slopes is necessary. Upon examination, the range in individual slope scores was -8.60 to +25.80 for the young adults, and -7.80 to +7.80 for the elderly adults. Due to the wide range in actual compliance slope estimates, the average slope was tested to find out if it differs significantly from zero. If the slope differs significantly from zero, this would show that meaningful change has occurred in actual compliance values. Upon analysis, the estimated average slope of 2.64 for the young group was significant (i.e., found to differ significantly from zero). This result was unexpected as it was presumed that young participants would improve, not decline, in performance over the four-week medication regimen. The average slope for the actual compliance scores of the elderly group did not differ significantly from zero. No significant change in cognitive errors occurred over the four-week period.

Testing the Linear Model of Change

The next question addressed by growth curve analyses concerned the accuracy of the linear model in accounting for variance in the repeated observations. Before the growth curve analyses were conducted, a straight line model of change was selected as the most accurate descriptor of change. However, based on the obtained R^2 values, it is questionable whether or not the linear model is the best descriptor of the individual trajectories. Concerning the mean coefficient of determination (R^2), the straight-line model of change accounted for 39% of the variance in self-reported compliance (see Figures 1 and 2). In addition, the linear model explained 35% of the variance in actual compliance (see Figures 3 and 4). However, caution must be taken when interpreting these R^2 values as they can be misleading.

For instance, individual R^2 values may be low or high, because the dependent variable (self-reported compliance or actual compliance) is not changing linearly. Thus, the trajectory of self-reported compliance and actual compliance scores may be better described by a more complex model (i.e., a model that accounts for more explained variance). Another potential explanation is that the dependent variables are not exhibiting enough variability to show change over time. As such, R^2 is a good descriptor of the adequacy of

a model across a population, but may be misleading as an estimate of linearity within-individuals. To correct this problem, the square root of the residual variance (RMSE) is used to estimate the spread of each participants' data around a straight-line model of change. By calculating the RMSE, the variance that is unaccounted for by the linear model can be observed. For self-reported compliance, RMSE estimates range from zero to 20.68 among young and elderly participants, with an average RMSE of 6.24. As for actual compliance, RMSE estimates range from zero to 31.38, with an average RMSE of 7.59. As can be seen, the square root of the error variance ranges more than 20 points between individual self-reported compliance ratings and more than 30 points for actual compliance scores. Evidently, self-reported compliance and actual compliance do not conform ideally with the linear model of change. However, the straight-line model of change provides an adequate description of the data for many participants, because of the wide variability of scores around a straight line.

Improvement in Self-Reported Compliance and Actual Compliance Scores Over Time

It was predicted that the young group would show greater improvement in self-reported compliance ratings (see Table 2) when compared with the

elderly group during the four-week medication regimen. However, results did not show significant differences in self-reported compliance ratings over the four weeks between the young and elderly participants, t (2, 58) = -.94, p = .351, n.s., r = .12. Next, it was hypothesized that the young participants would show greater improvement in actual compliance (see Table 2) when compared with the elderly participants over the four-week period. Significant differences in actual compliance performance were found, t (2, 58) = 2.04, p = .045. This finding was contrary to the hypothesis, as the older adults showed more improvement than the younger adults over time, r = .26.

Accuracy of Self-Reported Compliance Ratings

It was hypothesized that young and older adults would overestimate their self-reported compliance. Self-reported compliance and actual compliance scores were converted to a score out of 100. Using the converted scores, separate paired-sample t-tests were conducted for the young and elderly groups. It was found that young adults gave an average rating of 83% to their compliance. Their actual compliance scores were higher, at an 88% compliance rate. A significant difference between self-reported compliance ratings and actual compliance scores emerged for the young adults, t (1, 29) = 3.54, p = .001, r = .42. This finding was contrary to the hypothesis, as it was

expected that the young group would overestimate (as opposed to underestimate) their self-reported compliance ratings. Older adults stated that they complied with the medication regimen an average of 88% of the time. However, regarding actual compliance, older adults successfully complied with the medication regimen approximately 92% of the time over the four weeks. In addition, a significant difference between self-reported compliance ratings and actual compliance scores were also found for the elderly adults, t (1, 29) = 2.41, p = .023, r = .30. Again, the finding was contrary to the hypothesis, as the elderly group was expected to overestimate their self-reported compliance ratings.

Group Differences in Self-Reported Compliance Ratings and Actual Compliance

It was anticipated that the young adults would rate their compliance higher than the older adults. However, no significant difference was found between the two groups, t (2, 58) = -1.69, p = .097, n.s., r = .22. It can be concluded that the younger participants did not exhibit higher self-reported compliance ratings in comparison to the elderly adults. For the next hypothesis, it was expected that the young group would achieve better actual compliance scores when compared with the elderly group. Although a

significant difference in actual compliance was found, t (2, 58) = 2.33, p = .023, the finding opposed the hypothesis. The older adults committed significantly fewer cognitive errors while following the medication regimen in comparison to the younger, r = .29.

Predictors of Change in Self-Reported Compliance and Actual Compliance

Multiple regression analyses were performed to identify predictors of change in self-reported compliance and actual compliance for the young and elderly groups. No significant variables were found to predict the intercept values for self-reported compliance and actual compliance (see Table 4). However, several variables emerged as significant predictors of change for self-reported ratings and actual compliance (see Table 5). Event-based prospective memory predicted change in self-reported compliance for the young group, t (1, 29) = -2.12, p = .04, r = .27, R^2 = 22.78, part cor = -.381, over the four-week period. However, no significant predictors emerged for the elderly group over the four-week period. Event-based prospective memory approached significance for the elderly group, t (1, 29) = -1.87, p = .074, r = .24, R^2 = 16.52, part cor = -.348. Regarding actual compliance, SPT scores significantly predicted change in actual compliance performance over the four weeks for the young group, t (1, 29) = -2.15, p = .042, r = .27, R^2 = 24.80, part cor = -.381.

Again, no significant predictors emerged for the elderly group.

Recall of the Medication Regimen

To test hypotheses regarding accuracy of recall, participants were asked to rate how well they believed they could recall important information from the medication regimen (see Table 6). It was predicted that the young participants would attribute a higher rating to their ability to recall important medication information when compared with the elderly participants (see Table 6). No significant differences in ratings of recall were found between the two groups, t (2, 58) = 1.39, p = .168, n.s., r = .18.

Additionally, young and older adults provided written answers to questions regarding the medication regimen. It was hypothesized that the young adults would show better recall of the medication information when compared with older adults. This hypothesis was supported, as the young group (M = 28.08) recalled more medication information in comparison to the elderly group (M = 24.17), t (2, 58) = 2.48, p = .016, r = .31.

Discussion

The purpose of the present study was to contrast young and older adults on self-reported and actual medication compliance. Research shows that older adults have difficulty remembering to take their medication as prescribed

(Isaac et al., 1993; Morrow et al., 1988). In addition, older adults have difficulty reporting to their physician how well they are complying with the medication regimen (Strecher et al. 1989; Rudd, 1990). Further exacerbating these problems is that older adults often follow complex medication regimens as they get older, while concurrently experiencing a decline in cognitive abilities (Park & Kidder, 1996). This study sought to answer the question "Is the poor medication compliance demonstrated by elderly adults associated with declining cognitive abilities?" To investigate this question, young and older adults who were not presently taking any medication were recruited. This allowed for the implementation of a pseudomedication regimen, without the cognitive burden of remembering actual prescribed medications. The main focus of the study was to investigate the difference between the abilities of young and older adults to accurately rate and adhere to a complex, pseudomedication regimen for four weeks. Young adults served as a control group as their cognitive ability is presently at its peak.

The major findings of this study were (a) the older adults did not differ from the young adults in their self-reported compliance ratings over the four-week period; (b) the older adults exhibited better compliance with the medication regimen when compared with the younger adults; and (c) the young

adults demonstrated superior cognitive performance when compared with older adults on event-based prospective memory, retrospective memory and speed of processing. These findings suggest that previous studies demonstrating the inability of older adults to follow complex medication regimens (Darnell et al., 1986; Morrel et al., 1989) cannot be attributed solely to the declining cognitive abilities of older adults.

Prospective Memory

Young and older adults were compared on their ability to complete an event-based prospective memory task. As hypothesized, the young group demonstrated superior performance on this task. Although some research does support this finding (Cockburn & Smith, 1988; Dobbs & Rule, 1987), many studies fail to show age-related decrements in event-based prospective memory (Sinnot, 1986; West, 1988; Einstein & McDaniel, 1990). Because age-related deficits in prospective memory are attributed to a decline in self-initiated retrieval processes (Craik, 1986), it is possible that age decrements would not arise in event-based prospective memory. This is because event-based prospective memory requires little self-initiated retrieval, as the future action is performed only after an external cue (e.g., a messy page, a specified word)

serves as a reminder. However, past studies may have been unable to find age differences in prospective memory because the retrospective portion of the task (e.g., write one's name) was too simple (Einstein et al., 1992). In the present study, the retrospective portion of the prospective task was multifaceted. Participants were required to remember to (1) tear out the messy page; (2) write their full name; (3) write the name of the questionnaire; and (4) list the relevant information in the top right-hand corner on the front of the page. Thus, in accordance with more recent analyses (Einstein et al., 1992; McDaniel & Einstein, 1992; McDaniel & Einstein, 1993), young adults performed better than older adults on event-based prospective memory tasks when the retrospective portion of the task is complex.

Regarding time-based prospective memory, it was expected that young adults would perform better than older adults. However, no significant difference emerged between the two groups. Due to the high self-initiated retrieval processes involved in this task, age decrements in time-based prospective memory is a common finding (Einstein et al., 1995). However, the absence of a significant finding between young and elderly adults in the present study may result from the time-based occurring outside the laboratory. In the study, participants were asked to phone the lab on a specific day at a

predetermined time. It is possible that the lack of experimental control may have resulted in participants using an external cue (e.g., reminder note) to prompt remembering. This would convert the task into a simple event-based prospective memory task, which past studies have failed to find age differences (West, 1988; Einstein & McDaniel, 1990).

Retrospective Memory

Young and older adults were compared on a retrospective memory task, called Subject-Performed Tasks (SPTs). SPTs were selected because they are an activity-specific retrospective memory task, which contains characteristics similar to the act of medication-taking. Contrary to the hypothesis, the young group performed better than the older adults on the retrospective memory task. Although age decrements in retrospective memory ability is a well-established finding (Hultsch & Dixon, 1990; Smith, 1996), the multimodal nature of SPTs could reduce age differences typically observed in free recall tasks (Backman, 1985; Backman & Nilsson, 1985; Norris & West, 1993). However, this finding was not replicated in the present study, as a significant age-related difference in retrospective memory ability emerged.

The young and elderly adults were compared on working memory ability. Contrary to the well-established finding that working memory declines

with age (Babcock & Salthouse, 1990; Dobbs & Rule, 1989; Salthouse, 1991), no group differences were found. This may have occurred because the processing aspect of the working memory task was insufficiently demanding. Prior studies demonstrating age differences in working memory ability have used measures with a more demanding processing task (Salthouse & Babcock, 1991; Salthouse, 1991). For instance, Salthouse and Babcock (1991) used the Computation Span as a measure of working memory. This measure requires the participant to answer arithmetic problems (the processing requirement), while simultaneously remembering the last digit in each problem (the storage requirement). In contrast, the Sentence Construction task was used in the present study. This task requires the participant to read the sentence aloud (the processing requirement), while remembering the underlined and capitalized word from the last sentence (the storage requirement). The processing requirement for the task in this study was evidently less demanding than the processing requirement used by Salthouse and Babcock (1991). Further exacerbating this problem is that recent studies have demonstrated that efficiency of processing speed is the major factor involved in age differences in working memory (Salthouse, 1992a; Salthouse & Kersten, 1993).

As such, the young adults were expected to perform better than older

adults on a speed of processing task (the Digit Symbol). As expected, large age-related differences in speed of processing were found. This finding supports what is commonly reported in the literature (Babcock & Salthouse, 1990; Morris, Gick & Craik, 1988; Salthouse, 1994).

Predictors of Self-Reported Compliance

To identify variables that may predict change in self-reported compliance over time, five memory variables (event-based prospective memory, time-based prospective memory, retrospective memory, working memory, and speed of processing) were entered into a multiple regression analysis. Event-based prospective memory emerged as the only significant predictor of change in self-reported compliance for the young adults. Event-based prospective memory involves remembering to perform a future action when a specific, external cue (e.g., a list) prompts remembering. Prospective memory is integral to successful medication-taking as one must remember to take medication in the future. Event-based prospective memory is involved in medication-taking when an individual makes a list or relates medication-taking to a certain event to remember to take their medication. To improve medication compliance, younger adults may have adopted such strategies as the four-week period progressed. Furthermore, event-based prospective memory

significantly predicts changes in self-reported compliance ratings for young adults, as it was found that this sample of younger adults performed better on an event-based prospective memory task when compared with older adults.

No significant predictors of changes in self-reported compliance emerged for the elderly adults. It is possible that the strategies used by older adults did not change during the study. A second possibility is that other factors may have contributed to changes in self-reported compliance besides memory. Beliefs about one's memory or types of strategy use may be potential factors of change in self-reported compliance ratings (Gould et al., 1997).

Predictors of Actual Compliance

Five memory variables were identified as potential predictors of change in actual compliance over the four weeks. Event-based prospective memory, time-based prospective memory, retrospective memory, working memory, and speed of processing were entered into a multiple regression analysis. The only significant predictor of change in actual compliance for the young adults was retrospective memory. Retrospective memory involves memory for past events (e.g., remembering the name of a medication). Retrospective memory is integral to medication-taking as it allows the individual to monitor all of the medications in one's regimen. Young adults may not have initially relied on

their retrospective memory abilities to remember how to take their medication correctly. Instead, young adults may have developed strategies based on their retrospective memory abilities (e.g., leave medication in a familiar spot) over the duration of the study. Additionally, the younger adults performed better on a retrospective memory task when contrasted with older adults. As such, it seems plausible that retrospective memory would emerge as a significant predictor for young adults as opposed to older adults.

No significant memory variables emerged as predictors of change in actual compliance for the elderly adults. It could be that older adults used the same strategies for the four-week duration of the study. In addition, other factors could be responsible for predicting change in actual compliance. Different types of strategy use or beliefs about one's memory could potentially influence change in actual compliance performance (Gould et al., 1997).

Perceived Complexity

It was anticipated that young adults would not find the regimen as complex when compared with older adults. Unexpectedly, the older adults did not find the regimen to be as complex as the younger adults did. The pseudomedication regimen was designed to be complex. Seven different medications were included in the regimen, while three of the medications were

to be taken four times daily. In addition, each medication had special instructions associated with it (e.g., take with food, take before bed). Several factors may account for the elderly group perceiving the regimen as less complex. The elderly group consisted of healthy older adults, who may be qualitatively different from elderly adults who are actually following complex medication regimens. Furthermore, the elderly sample included many educated, socially active participants. This may have resulted in a more motivated group. In contrast, young adults carrying a full university course-load may have been less motivated. Another possibility is that older adults may have used more external strategies (e.g., make a list and check off the medication used), which could have contributed to simplifying the medication regimen.

Perceived Importance

Perceptions of the study's importance were compared for the young and older adults. Interestingly, older adults perceived the study as more important than younger adults. Because older adults are more likely to be taking prescribed medication, the study of medication compliance may seem more realistic to them, resulting in a more serious approach to the study. Also, the younger adults were maintaining a full course load during the study, which may

have resulted in a lower level of motivation due to time constraints.

Self-Reported Compliance

Group Differences in Change over time. It was hypothesized that young adults would show greater improvement in self-reported compliance scores when compared with the older adults over the four weeks. The young adults did not show significant improvement in self-reported compliance when compared with elderly adults. Since young adults are at the peak of their cognitive abilities, it was anticipated that they would rely on specific memory instances when monitoring their self-reported compliance performance over the four-week period. It was expected that the young adults increased familiarity with the task would result in greater improvement in self-reported compliance ratings when compared with older adults. However, since older adults did not experience greater improvement in self-reported compliance ratings, it is possible that other factors (e.g., beliefs about one's memory) may influence self-reported ratings.

Group Differences in Self-Reported Compliance. It was expected that group differences would emerge between young and older adults in self-reported compliance ratings. Contrary to the hypothesis, young adults did not show higher self-reported compliance ratings. Again, it was expected that young

adults would rely on specific memory instances to achieve accurate self-reported compliance ratings. However, since young adults failed to show higher self-reported compliance ratings, it is possible that other factors (e.g., beliefs about one's memory) may contribute to self-reported compliance ratings.

Actual Compliance

Group Differences in Change over time. The young group was expected to show greater improvement in actual compliance scores over the four-week period. However, they failed to show greater change in actual compliance scores when compared to older adults. Surprisingly, the elderly adults demonstrated better actual compliance performance. It was reasoned that young adults would achieve better compliance due to their superior cognitive abilities. However, it appears that change in actual compliance performance is not contingent on memory alone. Motivation may be an important factor influencing changes in compliance behaviour. The young adults were maintaining a full course load during the study, whereas older adults were retired. Thus, older adults may have had more time to contribute to the study. Further, the older group perceived the study as more important. This finding could result in greater improvement in actual compliance scores over the

duration of the study. Another possibility is that the older group may have relied on external strategy use to ease the cognitive burden of the medication regimen.

Group differences in Actual Compliance. It was anticipated that young adults would show higher actual compliance scores when compared with the elderly group. Unexpectedly, older adults exhibited higher actual compliance scores. Again, it was reasoned that younger adults would have better compliance due to their superior cognitive abilities. However, it seems likely that other factors are important for successful medication compliance. As mentioned earlier, older adults were likely more motivated participants than younger adults. Additionally, older adults perceived the study as more important. Finally, older adults may have used more external strategies to assist in achieving optimal compliance.

Relationship between Self-Reports and Actual Compliance

Young and older adults were compared regarding the accuracy of their self-reported compliance. It was anticipated that both young and elderly adults would overestimate their self-reported compliance ratings. Contrary to the hypothesis, both groups did not overestimate their self-reported compliance ratings. Rather, the young and elderly adults significantly underestimated their

compliance when contrasted with actual compliance scores. Although the literature demonstrates that self-reports are often inaccurate (Roth, 1984; Park & Kidder, 1996), it is typically found that self-reported compliance is overestimated (Rudd, 1990; Spector et al., 1986). A possible explanation for this outcome is that young adults may have been aware that they lacked motivation. As a result, their actual compliance performance could have been better. As such, they have attributed a lower self-reported compliance rating than otherwise might be expected. Older adults may have simply casually estimated their ratings. For instance, a total of 133 medication mistakes could have been committed each week. If an older adult is contemplating their rating and figures that they missed approximately six medications, they might casually attribute a rating of 90% to their compliance, when in actuality their compliance rating is above 95%. Thus, older adults may have been unaware that missing 5 or 6 medications would still leave them with a rating of 95% or more.

Recall of the Medication Regimen

Next, the young and elderly were compared regarding their perceived recall of important medication information from the regimen. Contrary to the hypothesis, the younger adults did not attribute higher rating to their perceived

recall of medication information when compared with the older adults. Because younger adults are at the peak of this long-term memory ability, it was anticipated that the younger adults would attribute a higher rating to their perceived recall of the medication information. Again, it is possible that the young adults were aware that they did not perform optimally when following the medication regimen. As such, young adults may have felt that the important medication information from the regimen was not encoded very well in their memory.

For the final hypothesis, it was anticipated that the young group would show better actual recall of the medication regimen when compared with the elderly group. As expected, large age-related differences existed regarding the actual recall of the medication information. Not surprisingly, the young group demonstrated better performance in the actual recall of the medications as it is a long-term memory task. It is well-established in the literature that young adults are superior to elderly adults in long-term memory ability (Light & Anderson, 1983; Albert et al., 1988; Salthouse & Mitchell, 1989).

Limitations

A limitation of this study is that the young and older adults samples may not be representative of the typical younger and older adult populations.

The young adults in this study were first-year university students. Thus, they may be higher functioning or more motivated to participate in a research study than non-university students. The sample of older adults in the study were healthy, older adults not using any prescribed medications. Personal information provided by the elderly adults suggested that they may be more educated and possibly lead more active lives than other older adults. The older adults claimed that they were socially active in the community at least three days a week. Thus, they may have been more motivated to volunteer to participate in a demanding four-week study.

The duration of this study may also have been a limitation. As the study was only four weeks in length, it is possible that medication compliance could improve or deteriorate over time. A longer study may provide different results than this study did.

The use of sealed medication bottles to record medication-taking may have produced a technical limitation to this study. Although the medication lid had a tape seal, the participant could remove the tape and count the number of medications they had taken. It was stressed to the participant that the results should be honest and accurate. However, ensuring that participants would not look inside the medication bottles was not possible. A better method of

recording medication compliance would be to use the Medication Event Monitoring System (MEMS). This system involves using medication bottles with a microchip hidden in the medication lid. Thus, whenever the participant removes the lid to take a medication, the date and time of the occurrence is recorded. This system clearly provides a superior method of recording medication adherence. However, it is expensive and beyond the budget allotted for this study.

A further limitation to this study was asking participants to use their imaginations to pretend that they were afflicted with five different medical problems. In addition, they were asked to keep track of seven medications and pretend that they were really taking them. The participants were informed that missing or taking too many medications would adversely affect their health. Unfortunately, monitoring the participants' use and effectiveness of their imagination was not possible. As such, this study would be more reliable if the participants were actually taking the medications.

A final limitation to this study is that a cross-sectional design was used. As mentioned earlier, age-related differences emerging from cross-sectional studies may be exaggerated due to cohort effects (Schaie, 1988). The use of a longitudinal study in which participants are tested at specified ages, and

assessed at regular intervals would have improved the internal validity of the study (Schaie, 1988).

Directions for Future Research

Future investigations may strengthen the findings of this study by following participants for a longer period. It is uncertain whether four weeks is sufficient time for a clear medication-taking pattern to emerge. Recording medication-taking behaviour over several months may show patterns of compliance improvement or decline. Furthermore, the use of a MEMS recording device in future studies would contribute greatly to the recording accuracy of actual medication compliance.

The present study has established that healthy older adults (i.e., those not taking any prescribed medications) possess the ability to adhere to a complex pseudomedication regimen. However, a study is needed that would contrast medication-taking older adults with older adults who are not taking prescribed medications. Such a study could contrast the two groups on factors that may influence medication-taking behaviour. For instance, a study could be conducted to observe if group differences exist in different types of memory, level of social activity, general cognitive functioning, lifestyle factors (e.g., diet, alcohol use), alertness, medication-taking strategy use, etc.

Conclusion

According to past findings, the present study has demonstrated that younger adults generally exhibit superior performance in memory abilities involved in medication-taking (Park & Kidder, 1996). Growth curve analyses revealed differences regarding self-reported ratings. However, older adults demonstrated better actual compliance performance in comparison to young adults. As such, it appears that the declining cognitive abilities of older adults cannot be implicated as the sole factor associated with poor medication compliance.

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Appendix 1

Procedures to be Followed

Procedures to be followed
MEDICATION COMPLIANCE

Purpose of the study:

The purpose of this study is to examine the medication-taking behaviours of introductory psychology students and older adults when placed on a pseudo-medication regimen for 4 weeks. This regimen is designed to reflect that of a typical older adult.

Procedures to be followed

During this study you will be asked to:

1. tell us about your age, educational background, mood, and health status
2. complete some memory questionnaires and answer some questions about your memory
3. follow a pseudo-medication regimen for 4 weeks
4. answer a few questions each week about the pseudomedication regimen

Time Required

Your participation will consist of 5 visits.

1. An Initial Interview lasting 1 - 1.5 hours. (Week 1)
2. Two telephone interviews approximately 30 minutes in length. (Weeks 2 and 4)
3. A home visit lasting about 30 minutes. (Week 3)
4. A Final Interview lasting approximately 45 minutes. (Week 5)

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 Developmental Psychology are able to understand how adults learn and remember.

Appendix 2

Informed Consent Form

LAKEHEAD UNIVERSITY

INFORMED CONSENT FORM

Title of the Investigation: MEDICATION COMPLIANCE

Investigators: Leslie McDonald-Miszczak, Ph.D
Trevor Sullivan, M.A. 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 the 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 understand that my data will be stored in a locked laboratory and participants will be informed that their data must remain on location at Lakehead University for a period of seven years.

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 3

Event-Based Prospective Memory Task

Event-Based Prospective Memory Task

Note: this task is to be presented at the beginning of the Initial Interview.

The first questionnaire that I'll ask you to complete is the Personal Information Questionnaire. This questionnaire asks you a few questions regarding your age, educational background, health status, and so on. When you are completing this questionnaire or one of the other questionnaires that I will be giving you today, you may notice that the odd page is very messy and difficult to read. Lately, I have been getting the occasional messy page from the Print Shop. I guess they must be having trouble with their photocopiers. Anyhow, I checked through your questionnaires for messy pages and I think I got them all. But if I didn't, I was wondering if you could do me a favour? If you come across a messy page in one of the questionnaires, could you pull the page out of the booklet and write the name of the questionnaire from which you pulled the messy page, in the top right-hand corner? Thanks for your help.

Appendix 4

Personal Information Questionnaire

ID_____

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. separated
   e. divorced
   f. 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. I live alone
   e. 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 month
    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:
    Primary 1 2 3 4 5 6 7 8
    Secondary 9 10 11 12 13
    College 1 2 3 4
    University 1 2 3 4 5 6 7 8 9
    Trade School 1 2 3 4

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 (please specify) _____

THE FOLLOWING ARE A FEW QUESTIONS ABOUT YOUR GENERAL HEALTH:

12. 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

13. Compared 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

14. 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

15. Do you require a hearing aid?
    a. yes
    b. no

16. 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

17. 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

18. 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. epilepsy/seizures
    j. glaucoma
    k. gout
    l. headache

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) _____

19. 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 the arteries in the neck)
    d. gallbladder surgery
    e. hernia repair
    f. hysterectomy
    g. mastectomy
    h. open heart surgery
    I. prostate surgery
    j. tonsillectomy

20. 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

21. 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 5

The Centere for Epidemiological Studies - Depression Scale

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 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:

1. Don't spend too much time thinking about your answer. Give the first natural answer as it comes to you.

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

3. 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 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 time (3-4 days)
    d. Most or all of the time (5 - 7 days)

Appendix 6

Metamemory in Adulthood Questionnaire

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 time 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. If 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 birthdays.
   a. agree strongly
   b. agree
   c. undecided
   d. disagree
   e. disagree strongly

---

7. 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

---

8. I get anxious when I am asked to remember something.

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

---

9. I have difficulty remembering things when I am anxious.

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

---

10. 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

---

11. I have no trouble keeping track of my appointments.

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

---

12. 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

---

13. I feel jittery if I have to introduce someone I just met.

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

---

14. 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

---

15. I am poor at remembering trivia.

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

---

16. 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

---

17. 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

---

18. 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

---

19. 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

---

20. I am good at remembering the order that events occurred.

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

---

21. I am good at remembering conversations I have had.

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

---

22. 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

---

23. 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

---

24. I often forget who was with me at events I have attended.

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

---

25. 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

---

26. I am good at remembering the places I have been.

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

---

27. 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

---

28. 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

---

29. Do you try to concentrate hard on something you want to remember?

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

---

30. 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

---

31. I have no trouble remembering where I have put things.

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

---

32. Do you make mental images or pictures to help you remember?

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

---

33. I am good at remembering things like recipes.

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

---

34. 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

---

35. Do you mentally repeat something you are trying to remember?

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

---

36. 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

---

37. Do you ask other people to remind you of something?

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

---

38. 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

---

39. I am as good at remembering titles of books, films and plays.

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

---

40. I have no trouble remembering lyrics of songs.

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

---

41. Do you write yourself reminder notes?

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

---

42. I am good at remembering names of musical selections.

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

---

43. 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

---

44. Do you write appointments on a calendar to help you remember them?

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

---

45. 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

---

46. I am good at remembering the content of news articles and broadcasts.

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

---

47. Remembering the plots of stories and novels is easy for me.

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

---

48. 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

---

49. Do you write shopping lists?

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

Appendix 7

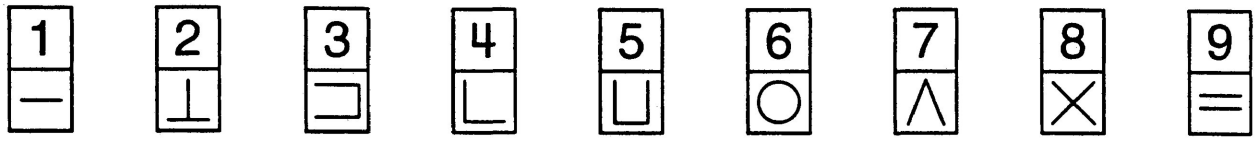
The Digit Symbol Subtest of the Wechsler Adult Intelligence Scale - Revised

Digit Symbol Instructions

For this task, you are required to match the appropriate symbol with the appropriate number. For example, in the "samples" section, you are given 7 numbers with each number being assigned a specific symbol. For the number 2, you would write this symbol **(point to the appropriate symbol)** in the box below it. For number 1, you would write this symbol **(point to the appropriate symbol)** in the box below. Please continue with the remainder of the sample examples, so you can become better acquainted with the task. When you have completed the "samples" section, you will have 90 seconds in which to complete as much of the task as possible.

Note: Use a stopwatch to time the task

Digit Symbol—Coding



Sample Items

2	1	3	7	2	4	8	2	1	3	2	1	4	2	3	5	2	3	1	4

5	6	3	1	4	1	5	4	2	7	6	3	5	7	2	8	5	4	6	3

7	2	8	1	9	5	8	4	7	3	6	2	5	1	9	2	8	3	7	4

6	5	9	4	8	3	7	2	6	1	5	4	6	3	7	9	2	8	1	7

9	4	6	8	5	9	7	1	8	5	2	9	4	8	6	3	7	9	8	6

2	7	3	6	5	1	9	8	4	5	7	3	1	4	8	7	9	1	4	5

7	1	8	2	9	3	6	7	2	8	5	2	3	1	4	8	4	2	7	6

Appendix 8

Sentence Construction Task

Working Memory Task Instructions

For the following task, I'll be presenting sentences one at a time and asking you to read them aloud at your normal reading pace. One of the words in each sentence is printed in all capital letters and underlined. For the set of sentences these words will form a new sentence. These sentences are contained in this binder. I will be presenting these sentences one at a time and flipping to the next page when you have completed reading the sentence. At the end of a set of sentences, I will ask you to report the new sentence. **Note: open the binder to the first example sentence.** For example, I would like you to read the example sentence and take note of the word that is underlined and printed in capital letters. **Note: when the participant has finished reading the sentence, flip the page and move on to the next example sentence.** Next, I would like you to read this sentence and once again be sure to pay special attention to the word that is underlined and printed in capital letters. When you see the blank page, tell me the short sentence that the two underlined words form? Let's try another one. This next example will be 3 words long **(Note: do example)**. The remainder of the task will follow this format as I will present a group of sentences, one sentence at a time. The sentences will gradually get longer as we proceed. At the end of a set of sentences, you will see a blank page and I will ask you to report the new sentence. Any questions? Are you ready to begin?

Note: If the participant misses 2 sets of sentences within a set, terminate the task.

Working Memory Sentences

Note: Words in upper case and underlined form sentences.

She was a GOOD baby.
He relied on his LUCK.

THE words on the page were printed in red ink.
The MAN gave his wife a ring as a Christmas gift.
Their antique chair broke when the guest SAT on it.

THE filing cabinet was stuffed with so much paper that it could not be closed.
The BIRD flew out of her nest to fetch some food for her young.
The pond FROZE solid during the cold snap in January.

SHE picked up the needles and began to knit the sweater.
The deer RAN across the meadow toward the safety of the woods.
The car was going very FAST when it left the road and hit the tree.

THE boat left the dock and headed out into the calm water.
On top of the hill stood the tallest TREE he had ever seen.
He FELL off his bicycle and scraped his knee badly.

SHE could hardly tie her shoelace because her hands were trembling so.
The swarm of bees CHASED the children who had broken the hive.
THE girls talked for hours and hours before they fell asleep.
The player dropped the BALL even though it was thrown right to him.

The calendar on the wall showed that it was THE first day of March.
The DOG guarded the house while his owners were away on holidays.
The forecaster predicted that it WAS going to be a cold winter.
The sea lions began BARKING as soon as they finished their trick.

The day was so windy that the sailor decided to return to THE harbor.
A clown handed candy to the young CHILDREN during the parade.
He WATCHED the ducks fly to the shallow pond.
The beer parlor served draft by THE glass or mug.
The CHIPMUNKS gathered food for the winter and hid it in a tree.

The breeze blowing off the blue ocean was FRESH and cool.
She put the VEGETABLES in the boiling water along with a little salt.
Television programs today ARE different than those of twenty years ago.
It was a VERY warm day for the middle of December.
The oysters served on their shells with hot sauce were TASTY.

THE hawk circled his prey several times before diving to capture it.
The DOCTOR was over eighty years old when he retired from practice.
The postman DELIVERED the large package to the house.
When shifting gears you have to remember to depress THE clutch.
The BABY cried all night because her new teeth hurt.

The army recruits were required to POLICE the grounds before dinner.
The robber was ARRESTED only two blocks from the holdup scene.
The child played with the rubber duck while his mother gave HIM a bath.
The party resumed in the garden AFTER being interrupted by the shower.
THE cup of hot coffee burned his lips.
The two butlers gossiped about the MURDERS that had occurred.

The play is a clever comedy which kept THE audience laughing heartily.
The little HORSE stood under the maple tree near the fence.
The skier INJURED his back when he fell on the ski hill.
The woman took HER car to the garage to have it repaired.
The cat sharpened her claws on the LEG of the table scarring it deeply.
The twins celebrated their fourth birthday YESTERDAY.

THE kittens were six weeks old when they were sold.
The SECRETARY sat at her desk smoking a cigarette.
The professor REMAINED after class to answer additional questions.
The dentist fitted the bridge IN the patient's mouth.
The lovely music on the radio encouraged THE couple to dance.
The OFFICE was located in a large building near the center of town.

ID_____

Working Memory Sentences

Example

1. _____
   Good luck.

2. _____
   The man sat.

Items

1. _____
   The bird froze

2. _____
   She ran fast

3. _____
   The tree fell

4. _____
   She chased the ball

5. _____
   The dog was barking

6. _____
   The children watched the chipmunks

7. _____
   Fresh vegetables are very tasty

8. _____
   The doctor delivered the baby

9. _____
   Police arrested him after the murders

10. _____
    The horse injured her leg yesterday

11. _____
    The secretary remained in the office

Appendix 9

Subject-Performed Task

Subject Performed Task (SPT) Instructions

For this task, I'll be presenting a list of 35 action pairs. An "action-pair" involves two words presented together as a pair which describe a particular action. For example "shuffle-cards", "pinch-wrist", or "push-box". I will be presenting these action pairs verbally, one at a time. After I present each action pair to you, I want you to perform the action that I've described in the action pair. **Note: do several examples to ensure that the participant understands the procedure.** After I have presented the 35 action pairs, you will be given 7 minutes to recall as many action pairs as possible. How many action pairs do you think you'll be able to recall?

Note: Present the 35 action pairs followed by the relevant sheet for the free recall procedure.

Note: the same 35 action-pairs will be presented in two additional trials. Also, a global prediction regarding their recall will be made prior to presentation of the action pairs.

Note: Write Global Prediction at the bottom of the Digit Symbol Task.

SPT PREDICTION STUDY WORD PAIRS

SMELL FLOWERS	CLAP HANDS
BLINK EYES	TIE STRING
RUB ELBOW	SNAP FINGERS
CLENCH TEETH	CLOSE BOOK
HOLD BREATH	RAISE EYEBROWS
SHRUG SHOULDERS	FOLD NAPKIN
RIP PAPER	SCRATCH CHIN
WIPE FOREHEAD	RATTLE KEYS
PLUG EARS	TOUCH FACE
SQUEEZE SPONGE	SLAP THIGH
BLOW KISS	ROLL DICE
WAVE GOODBYE	CROSS LEGS
FASTEN PIN	LICK LIPS
DROP SPOON	NOD HEAD
WRINKLE NOSE	OPEN BOTTLE
COUNT PILLS	WRING CLOTH
CLOSE JAR	STACK CONTAINERS
WHISPER HELLO	

ID _____

SPT Word Pairs

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. _____ / _____
5. _____ / _____
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 10

Knowledge of Medication Questionnaire

ID_____

Knowledge of Medication Questionnaire (Adalat)

Note: if participant has knowledge of medication, investigate further.

1. Have you ever heard of a medication called Adalat?

   (Yes / No)

2. Do you know what this medication is designed to treat?

   (Yes / No)

3a. Do you have knowledge of hypertensive medication?

   (Yes / No)

b. If so, what do you know about hypertensive medication (re: names of hypertensive medications and a description of hypertensive medications)?

_____

_____

_____

_____

Note: Ask questions 4 - 7 for each hypertensive medication that the participant states.

4. Do you know how many times daily this medication is to be taken?

   (Yes / No)

5. Do you know the amount of medication that is to be taken daily?

   (Yes / No)

6. Do you know whether or not this medication is to be taken in conjunction with another medication?

   (Yes / No)

7. Do you know the context (i.e. with food, on an empty stomach, etc.) in which this medication is to be taken?

   (Yes / No)

8. Do you know the side effects associated with this medication?

   (Yes / No)

ID_____

Knowledge of Medication Questionnaire (Diltiazem)

Note: if participant has knowledge of medication, investigate further.

1. Have you ever heard of a medication called Diltiazem?

   (Yes / No)

2. Do you know what this medication is designed to treat?

   (Yes / No)

3a. Do you have knowledge of cardiovascular medication?

   (Yes / No)

b. If so, what do you know about cardiovascular medication (re: names of cardiovascular medications and a description of cardiovascular medications)?

_____

_____

_____

_____

Note: Ask questions 4 - 7 for each cardiovascular medication that the participant states.

4. Do you know how many times daily this medication is to be taken?

   (Yes / No)

5. Do you know the amount of medication that is to be taken daily?

   (Yes / No)

6. Do you know whether or not this medication is to be taken in conjunction with another medication?

   (Yes / No)

7. Do you know the context (i.e. with food, on an empty stomach, etc.) in which this medication is to be taken?

   (Yes / No)

8. Do you know the side effects associated with this medication?

   (Yes / No)

ID_____

Knowledge of Medication Questionnaire (Calcium)

Note: if participant has knowledge of medication, investigate further.

1. Have you ever heard of Calcium?

   (Yes / No)

2. Do you know what Calcium is designed to treat?

   (Yes / No)

3a. Do you have knowledge of medication designed to treat Osteoporosis?

   (Yes / No)

b. If so, what do you know about cardiovascular medication (re: names of medications designed to treat Osteoporosis and a description of Osteoporosis medications)?

_____

_____

_____

_____

Note: Ask questions 4 - 7 for each Osteoporosis medication that the participant states.

4. Do you know how many times daily this medication is to be taken?

   (Yes / No)

5. Do you know the amount of medication that is to be taken daily?

   (Yes / No)

6. Do you know whether or not this medication is to be taken in conjunction with another medication?

   (Yes / No)

7. Do you know the context (i.e. with food, on an empty stomach, etc.) in which this medication is to be taken?

   (Yes / No)

8. Do you know the side effects associated with this medication?

   (Yes / No)

ID_____

Knowledge of Medication Questionnaire (Vitamin D)

Note: if participant has knowledge of medication, investigate further.

1. Have you ever heard of Vitamin D?

   (Yes / No)

2. Do you know what Vitamin D is designed to treat?

   (Yes / No)

3a. Do you have knowledge of medication which is essential for bone maintenance?

   (Yes / No)

   b. If so, what do you know about medication which is essential for bone maintenance (re: names of medications which are essential for bone maintenance and a description of bone maintenance medications)?

_____

_____

_____

_____

Note: Ask questions 4 - 7 for each bone maintenance medication that the participant states.

4. Do you know how many times daily this medication is to be taken?

   (Yes / No)

5. Do you know the amount of medication that is to be taken daily?

   (Yes / No)

6. Do you know whether or not this medication is to be taken in conjunction with another medication?

   (Yes / No)

7. Do you know the context (i.e. with food, on an empty stomach, etc.) in which this medication is to be taken?

   (Yes / No)

8. Do you know the side effects associated with this medication?

   (Yes / No)

ID_____

Knowledge of Medication Questionnaire (Restoril)

Note: if participant has knowledge of medication, investigate further.

1. Have you ever heard of a medication called Restoril

   (Yes / No)

2. Do you know what this medication is designed to treat?

   (Yes / No)

3a. Do you have knowledge of insomnia medication?

   (Yes / No)

   b. If so, what do you know about insomnia medication (re: names of insomnia medications and a description of insomnia medications)?

_____

_____

_____

_____

Note: Ask questions 4 - 7 for each insomnia medication that the participant states.

4. Do you know how many times daily this medication is to be taken?

   (Yes / No)

5. Do you know the amount of medication that is to be taken daily?

   (Yes / No)

6. Do you know whether or not this medication is to be taken in conjunction with another medication?

   (Yes / No)

7. Do you know the context (i.e. with food, on an empty stomach, etc.) in which this medication is to be taken?

   (Yes / No)

8. Do you know the side effects associated with this medication?

   (Yes / No)

ID_____

Knowledge of Medication Questionnaire (Ventolin)

Note: if participant has knowledge of medication, investigate further.

1. Have you ever heard of a medication called Ventolin?

   (Yes / No)

2. Do you know what this medication is designed to treat?

   (Yes / No)

3a. Do you have knowledge of pulmonary medication?

   (Yes / No)

b. If so, what do you know about pulmonary medication (re: names of pulmonary medications and a description of pulmonary medications)?

_____

_____

_____

_____

Note: Ask questions 4 - 7 for each pulmonary medication that the participant states.

4. Do you know how many times daily this medication is to be taken?

   (Yes / No)

5. Do you know the amount of medication that is to be taken daily?

   (Yes / No)

6. Do you know whether or not this medication is to be taken in conjunction with another medication?

   (Yes / No)

7. Do you know the context (i.e. with food, on an empty stomach, etc.) in which this medication is to be taken?

   (Yes / No)

8. Do you know the side effects associated with this medication?

   (Yes / No)

ID_____

Knowledge of Medication Questionnaire (Atrovent)

Note: if participant has knowledge of medication, investigate further.

1. Have you ever heard of a medication called Atrovent?

   (Yes / No)

2. Do you know what this medication is designed to treat?

   (Yes / No)

3. Do you know how many times daily this medication is to be taken?

   (Yes / No)

4. Do you know the amount of medication that is to be taken daily?

   (Yes / No)

5. Do you know whether or not this medication is to be taken in conjunction with another medication?

   (Yes / No)

6. Do you know the context (i.e. with food, on an empty stomach, etc.) in which this medication is to be taken?

   (Yes / No)

7. Do you know the side effects associated with this medication?

   (Yes / No)

Appendix 11

Experimenter's Script for Initial Visit

Initial Visit

As you know, I'll be conducting this study over the next 4 weeks. First of all, I would like to thank you for your participation in this study. Without volunteers such as yourself, it would be virtually impossible to conduct research examining medication-taking behaviours. Please feel free to ask any questions at any time during the session and I'll do my best to answer them for you. As I mentioned earlier, this study will be conducted for a total of 4 weeks. The purpose of this study is to simulate a medication regimen that is commonly prescribed for ill older adults. We are interested in how healthy younger and older adults find the experience of trying to adhere to this type of regimen. Before we begin, I'd like to ask you a few questions about the medications used in this study (Note: Ask Knowledge of Medications Questionnaire).

Because of the nature of this study, it is paramount that this study mimic reality. Therefore, it is crucial that you and I maintain a pharmacist/patient style relationship. This will involve some imagination on your part as you will be taking one or more simulated medications for several imaginary illnesses.

Over the course of this study, you will be required to follow a simulated daily medication regimen. You will be asked to keep track of your "medications" using these pill bottles containing beads (**Note: hold up containers**). We will meet in person or talk on the telephone **every week** at a prearranged time in order for you to **(a)** answer a few questions about your medication-taking behaviours and **(b)** receive refills of your simulated medications. It is very important that you keep all of your pill bottles and used "medications". At the beginning of each week, you will start using newly filled bottles which will replace the used ones. Now it is very important for you to remember that you won't be asked to ingest any medications of any kind.

You will simply be asked to keep track of these beads as if you were taking them as medication During the final meeting, at the end of the 4 week period, you will be asked a final set of questions about your medication-taking behaviours and will return all of the pill bottles and unused beads at that time.

The imaginary illnesses that you will be suffering from are Hypertension (high blood pressure), Cardiovascular Disease (heart problem), Osteoporosis (weak bones), Pulmonary Disorder (breathing problem), and Insomnia (trouble sleeping). It is essential to remember that you have the aforementioned problems and that it is important for you to take each medication, in the correct dosage and context, and at the correct time. However, before I begin to describe the medication scenario that you will be following, I'd like to take a moment to once again review the imaginary illnesses that you will be afflicted with. These include: Hypertension (high blood pressure), Cardiovascular Disease (heart problem), Osteoporosis (weak bones), Pulmonary Disorder (breathing problem), and Insomnia (trouble sleeping).

The Medication Scenario

Your medication regimen will consist of a total of 7 medications.

1. For your hypertension (high blood pressure) problem, you will be taking a medication called **Adalat**. The purpose of this drug is simply to reduce your high blood pressure and although this condition usually has no apparent symptoms, it is important that you continue to take your medication as prescribed. You should take one tablet twice daily, preferably at the same two times each day. Adalat should be taken with food. The first time you take this medication, you may feel slightly lightheaded and dizzy, especially if you have been taking a water pill. Therefore, you might want to consider taking the first dose at bedtime. If there are any

noticeable side effects such as vomiting, diarrhea, etc., I encourage you to contact me. Of course you won't be experiencing any of these side effects, as you won't be ingesting any medication. However, it is important to mention these things in order to mimic a patient's visit to the doctor.

2. For the treatment of cardiovascular disease (heart problem), you will be required to take **Diltiazem**. This drug acts by treating chest pain due to angina. This medication involves taking one tablet, four times daily. Medication should be taken at approximately the same time each day. Also, it is important that the tablets are taken as a whole and not broken, crushed or chewed. If you experience any bothersome side effects such as lightheadedness, nausea, etc., be sure to contact me.

3. For your problem with osteoporosis (weak bones), you will be required to take two supplements. These include a **Calcium supplement** and a **Vitamin D supplement.** The calcium supplement is important for improving the strength of your bone structure and it involves taking two 500 mg tablets daily to meet your 1000mg calcium requirement for the day. Secondly, a vitamin D supplement must be taken in conjunction with the calcium supplement, as it is necessary in facilitating the absorption of calcium in the stomach. Two 400 IU capsules of vitamin D should be taken daily. Both medications should be taken with a full glass of water an hour to an hour and a half after eating. If you notice any side effects from the aforementioned supplements, please contact me whenever possible.

4. For your bout with pulmonary disorder (breathing problems), it is important to use two puffers. These include a **Ventolin inhaler** and an **Atrovent inhaler**. Both of the inhalers are to be taken together four times daily, with 2 puffs at each usage. Because the two inhalers are to be used in conjunction with one another, it is important to remember to use the Ventolin inhaler

first as it is crucial in opening the lung airways. After waiting five minutes, the Atrovent inhaler should be used as it is effective in dilating the bronchioles, reducing mucus secretion and decreasing edema. If you notice any side effects from using these inhalers such as dry mouth, dizziness, etc. feel free to contact me.

5. The final medication you'll be taking is called **Restoril** and it is designed to treat your insomnia. This medication involves simply taking a single tablet before bed. If any side effects such as dizziness, irregular heartbeat, etc. persist from taking this medication, contact me as soon as possible.

In regards to the medication-taking, it is really a very simple procedure. **Note: do a demonstration while explaining the procedure - but don't drop the bead into the container or you'll lose it.** Next, I'd like to go over the procedure for "taking" medication. When it is time for you to take your medication, you simply remove one of the beads from the pill bottle and place it into the container. This will signify that you have taken your pill. Any questions about the medication-taking procedure?

Next, I'd like to go over the procedure for using the simulated puffers. Instead of using an actual puffer, this procedure will require using these booklets and a container (the same container involved in the medication-taking procedure) to record your simulated puffer use. **Note: hold up the booklets and do a demonstration.** A single booklet will be used to represent each puffer. You'll notice that inside the booklet there is a pocket on the right side of the fold. Inside the right pocket, there are a number of stickers which will be used to represent the number of times in a day that you use your puffer. Therefore, when it is time to use your puffer, you simply take a sticker from inside the right pocket, fold it in half, and insert it into the container.

This will signify that you have used your puffer once that day. Since you are required to use each of your puffers four times a day, you will have to repeat this procedure four times daily for each simulated puffer. Also, remember that when you are using the puffers in conjunction with one another, it is important to use the Ventolin Inhaler first, wait five minutes, and then use the Atrovent Inhaler. Any questions about this procedure? I must stress that it is of the upmost importance that you record your results honestly and accurately, as this is what we are truly after. It is very important that you take this task very seriously and try your best to adhere to your medication regimen. However, if you forget to take your "medications" as prescribed, don't take extra doses to even it out. Stick to the medication instructions outlined on the pill bottles and take the next dose when appropriate. We are just as interested in the times when you forget your medications as when you remember them, so please be accurate.

Here is your **one week** supply of pill bottles and booklets for your simulated puffers, and some pamphlets informing you of the side effects associated with each medication. **Note: hand side effect sheets to participant one at a time, so they realize that there is a sheet associated with each specific medication.** It is very important to look at the side effect sheets and learn the potential drawbacks related to taking each medication. In this envelope, **(Note: pack the envelope in front of the participant)** I'm packing your second week supply of pill bottles and booklets for your simulated puffers. On the front of the envelope, I have listed what is in the envelope and the date when you should begin using the medication. In this envelope, labelled "Confidential Questionnaire Week 1" **(Note: pack the envelope in front of the participant)** I am enclosing one questionnaire which is to be completed during the telephone interview at the end of the first week. When it is time to complete this questionnaire, you simply remove the

questionnaire from the envelope (notice that it isn't sealed), complete it, place it back into the same envelope, and seal it. Finally, I am giving you a larger-sized envelope for your materials. This means that when you have finished using your medication from Week 1, and have completed your Confidential Questionnaire, place both sets of materials into this larger envelope and seal it. Any questions? If this all seems a bit confusing, refer to the labelled envelopes for information or give me a call (I'll be providing me telephone number and the lab phone number shortly). Also, I'll be phoning you the day before the telephone interview to remind you when to discontinue using the old medications and start using the new medications, and when to complete the questionnaire.

In regards to the remainder of the sessions, we will be meeting on the same day each week, for the next four weeks. Locations will vary for each meeting. Week 2 will be a telephone interview. For Week 3, I'll visit you at home to conduct the interview. Week 4 will be another telephone interview and for Week 5, I'll need you to come to the school for the final meeting.

It is important to remember that the first day of your medication regimen begins tomorrow morning. As far as the next meeting is concerned, it would be ideal if I could phone you in exactly **one week**. Obviously, it is very important that you don't run out of medication and it would be greatly appreciated if we could talk on the telephone or meet on the prearranged dates. Therefore, the day before each scheduled meeting (regardless of whether it is a telephone interview or a personal interview), I will give you a telephone call to confirm our meeting. So, can we plan the remaining sessions **(set all dates and times).** Here is a medication calendar which includes the names of the investigators, my home phone, the phone number for the SALT

lab, along with the dates and times for the remaining sessions. If for some reason you are unable to meet me at a particular time or won't be home to receive my phone call, it would be ideal if you could call and reschedule our telephone interview or personal interview for another time that day. And I must stress once again that it is important to take this medication regimen seriously and record your results honestly and accurately. Also, it is very important to read the side effect sheets that I gave you earlier, so you are informed about the side effects associated with each medication. Do you have any final questions? Good luck with your medication regimen and I'll talk to you next **(fill-in appropriate date)**.

Appendix 12

Medication Side Effects Information Sheet

Adalat

ut Your Medicine:

edipine (nye-FED-i-peen) is used to relieve and control angina (chest pain). It is also used to at high blood pressure (hypertension). Nifedipine may also be used for other conditions.

ore Using This Medicine:

l your doctor, nurse, and pharmacist if you:

- have allergies.
- are pregnant or plan to become pregnant.
- are breast-feeding.
- are taking **any** other medicine, including those you buy yourself such as aspirin or cold medicine
- have **any** other medical problems.

per Use of This Medicine:

e this medicine:

- **exactly the way your doctor told you.**
- even if you feel well. Keep taking it to help your medical problem.

:autions While Using This Medicine:

ıing:

- Do not break, crush, or chew the capsules or tablets. Swallow them whole.
- **Do not miss any doses. If you do miss a dose of this medicine, take it as soon as possible. However, if it is almost time for your next dose, skip the missed dose. Do not double doses.**
- If you have been taking this medicine regularly, do not suddenly stop taking it.
- **Do not do hard work or exercise too long or too hard. Ask your doctor how much exercise is safe for you.**
- **See your dentist regularly to have your teeth cleaned. Check with your doctor or dentist if your gums swell, bleed, or feel tender.**
- **If you think you may have taken an overdose of this medicine, check with your doctor.**
- **Do not give any of your medicine to others. It may hurt them.**
- **Do not leave this medicine where children can get it.**

sible Side Effects of This Medicine:

l your doctor if you notice any of these possible side effects: **Less common** -- Breathing ficulty, coughing, or wheezing; irregular or fast or slow heartbeat; skin rash; swelling of ankles, t, or lower legs

re -- Bleeding, tender, or swollen gums; chest pain; fainting; painful, swollen joints; trouble seeing

› tell your doctor if you have any other side effects.

MEDICATION: Diltiazem

OTHER NAMES: Apo Diltaz, Cardizem, Cardizem SR, Cardizem CD, Novo-Diltazem, Nu-Diltaz, Syn-Diltiazem

USUALLY PRESCRIBED FOR:
* Treatment of chest pain due to angina
* Reduction of high blood pressure

NOTE: Your prescription could be used for reasons other than those listed above.

SPECIAL INSTRUCTIONS:
* Take exactly as prescribed, even if you feel well.
* Do not stop taking this medication suddenly without your doctor's approval.
* Take at the same time each day.
* Keep your doctor's appointments so that your reaction to using this medication can be checked.
* If you forget a dose, take it as soon as you remember; however, do not double-up on dosing.
* Check with your doctor or pharmacist before taking any other medications.
* Take whole - not broken, crushed or chewed.
* May cause headaches during the first few days of treatment. This should go away in a few weeks.
* Alcohol should be used cautiously because the combination may cause dizziness or fainting.
* Can cause drowsiness and dizziness. Do not operate any machinery that requires you to be alert until you know how you will react.
* Side effects such as dizziness, flushing or swelling of the feet may be lessened if the medication is taken with food.
* Do not share your medicine with anyone.
* If refillable, do not run out of this before requesting a refill from your pharmacist.

POSSIBLE SIDE EFFECTS: Most people have few or no side effects when using this medication. Check with your doctor if any of the listed side effects, or other unusual problems, occur.
* Irregular or unusually fast heartbeat, increased occurrences or severity of angina or chest pain
* Swelling of the hands or feet
* Severe dizziness, fainting or tiredness
* Unusual bleeding, bruising or skin rash

Common side effects are lightheadedness, flushing, tiredness, stomach upset, frequent urination and muscle spasm. Contact your doctor if bothersome.

MEDICATION STORAGE:
* Store away from direct light, heat, and moist places such as bathrooms or below the kitchen sink.
* Store this medication away from children.

MEDICATION: Calcium Carbonate

OTHER NAMES: Apo Cal, Calsan, Caltrate, Nu-Cal, Os-Cal, Pharmacal, Tums

USUALLY PRESCRIBED FOR:
* Calcium supplementation

NOTE: Your prescription could be used for reasons other than those listed above.

SPECIAL INSTRUCTIONS:
* Take with a full glass of water or juice.
* The best time to take this is one to one and a half hours after meals.
* This medication is often used to add to the amount of calcium obtained from foods and dairy products. For further information, check with your dietician or doctor.
* Avoid caffeine-containing beverages as they will decrease the amount of calcium absorbed by the body.
* Do not take this medication within one to two hours after eating high-fiber foods or cereals.
* Check with your doctor or pharmacist before taking other medication.
* Do not share your medicine with anyone.

POSSIBLE SIDE EFFECTS:

Most people have few or no side effects when using this medication. Check with your doctor if any of the listed side effects, or other unusual problems, occur.
* Nausea or vomiting
* Dry mouth or thirst
* Constipation or diarrhea

MEDICATION STORAGE:
* Store away from direct light, heat, and moist places such as bathrooms or below the kitchen sink.
* Store this medication away from children.

Your health is my concern. Please call me if you have any questions about this medication.

Prepared by:_____, Pharmacist

Phone: 567-5231 Date: November 5, 1996

For a complete listing of Recommended Dietary Allowances, see p. 4.

	Generic Name *Brand Name Examples*	Supplied As	Generic Available
Rx	**Calcifediol**		
	Calderol	**Capsules:** 20 mcg, 50 mcg	No
Rx	**Calcitriol**[1]		
	Rocaltrol	**Capsules:** 0.25 mcg, 0.5 mcg	No
Rx	**Cholecalciferol (D_3)**		
	Delta-D[2]*, Vitamin D_3*[2]	**Tablets:** 400 IU, 1000 IU	No
Rx	**Dihydrotachysterol**		
	Hytakerol	**Capsules:** 0.125 mg	No
	DHT	**Tablets:** 0.125 mg, 0.2 mg, 0.4 mg	No
	Hytakerol	**Solution:** 0.25 mg/ml in oil	No
	Ergocalciferol (D_2)		
otc	*Calciferol Drops, Drisdol*	**Liquid:** 8000 IU/ml	No
Rx	*Drisdol*[3]	**Capsules:** 50,000 IU	Yes
Rx	*Calciferol*[1]	**Tablets:** 50,000 IU	No

[1] This product is also available as an injection.
[2] Sugar free.
[3] Contains the dye tartrazine.

Type of Drug:
Fat-soluble vitamin. Vitamin that can be stored by the body.

How the Drug Works:
Vitamin D promotes absorption and use of calcium and phosphate by the body and normal bone development and maintenance.

Uses:
As a dietary supplement.

To prevent and treat rickets (a vitamin D deficiency characterized by weak bones, deformed skeleton, bowed legs, deformed spine, "potbelly" appearance, sometimes flat feet and stunted growth, soft bones and deformed joints).

To help regulate levels of parathyroid hormone.

To prevent and treat postsurgical and other types of muscle cramps.

To treat certain types of calcium and phosphate disorders (eg, people on chronic renal dialysis).

Precautions:
Do not use in the following situations:

allergy to vitamin D
high calcium levels
malabsorption syndrome
vitamin D toxicity

Use with caution in the following situations:
hypoparathyroidism
kidney disease

Pregnancy: Adequate studies have not been done in pregnant women. Use only if clearly needed and potential benefits outweigh the possible hazards to the fetus.

Breastfeeding: It is not known if vitamin D appears in breast milk. Consult your doctor before using vitamin D supplements during breastfeeding.

Children: Safety and effectiveness in children in doses exceeding the RDA have not been established.

Tartrazine: Some of these products may contain the dye tartrazine (FD&C Yellow No. 5) which can cause allergic reactions in certain individuals. Check package label when available or consult your doctor or pharmacist.

Drug Interactions:

Tell your doctor or pharmacist if you are taking or if you are planning to take any over-the-counter or prescription medications with vitamin D. Doses of one or both drugs may need to be modified or a different drug may need to be prescribed. The following drugs and drug classes interact with vitamin D.

barbiturates (eg, phenobarbital)
cholestyramine (eg, *Questran*)
digoxin (eg, *Lanoxin*)
magnesium-containing antacids (eg, *Maalox*)
mineral oil
phenytoin (eg, *Dilantin*)
verapamil (eg, *Calan*)

Side Effects:

Every drug is capable of producing side effects. Many vitamin D users experience no, or minor, side effects. The frequency and severity of side effects depend on many factors including dose, duration of therapy and individual susceptibility. Possible side effects include:

Digestive Tract: Loss of appetite; abdominal cramps; constipation; excessive thirst; nausea; vomiting; diarrhea.

Nervous System: Weakness; irritability; headache; dizziness; drowsiness.

Other: Muscle and bone pain; increased blood pressure; itching; runny nose; increased urination; dry mouth; metallic taste; sensitivity to light; weight loss.

Guidelines for Use:

- Eating a balanced diet and periodic exposure to sunlight usually satisfies normal vitamin D requirements. Never use vitamin supplements as a substitute for a balanced diet.
- Compliance with dosage instructions, diet and calcium supplementation are essential.
- Swallow tablets and capsules whole. Do not crush or chew.
- Notify your doctor if any of the following occurs: Weakness, lethargy, headache, loss of appetite, weight loss, nausea, vomiting, abdominal cramps, diarrhea, constipation, dizziness, excessive thirst, excessive urine output, dry mouth or muscle or bone pain.
- Avoid mineral oil or magnesium-containing antacids while taking this drug.
- *Recommended Dietary Allowances (RDA)*—
  Adults: 200 IU
  Pregnancy and lactation: 400 IU
- *Common sources of vitamin D*—Fortified milk and milk products, eggs, sardines, fresh-water fish, chicken livers and cod liver oil.
- The total amount of vitamin D taken each day includes both dietary intake and supplements. Do not take more than the RDA unless advised by your doctor.
- Carefully measure liquid doses of vitamin D-containing products.

If you have questions concerning vitamin D, consult your pharmacist or doctor.

Estazolam, flurazepam, quazepam, temazepam and triazolam are benzodiazepines. For complete information on benzodiazepines, see p. 394.

	Generic Name *Brand Name Examples*	Supplied As	Generic Available
c-IV	**Chloral Hydrate**		
	Noctec	**Capsules:** 250 mg, 500 mg	Yes
	Noctec	**Syrup:** 250 mg/tsp, 500 mg/tsp	Yes
	Aquachloral Supprettes, Chloral Hydrate	**Suppositories:** 324 mg[1], 500 mg, 648 mg	No
c-IV	**Estazolam**		
	ProSom	**Tablets:** 1 mg, 2 mg	No
c-IV	**Ethchlorvynol**		
	Placidyl	**Capsules:** 200 mg, 500 mg, 750 mg[1]	No
c-IV	**Flurazepam HCl**		
	Dalmane	**Capsules:** 15 mg, 30 mg	Yes
c-II	**Glutethimide**	**Tablets:** 250 mg, 500 mg	Yes
c-IV	**Paraldehyde**		
	Paral	**Liquid (Oral, Rectal)**	Yes
c-IV	**Quazepam**		
	Doral	**Tablets:** 7.5 mg, 15 mg	No
c-IV	**Temazepam**		
	Restoril	**Capsules:** 15 mg, 30 mg	Yes
c-IV	**Triazolam**		
	Halcion	**Tablets:** 0.125 mg, 0.25 mg	No
c-IV	**Zolpidem Tartrate**		
	Ambien	**Tablets:** 5 mg, 10 mg	No

[1] Contains the dye tartrazine.

Type of Drug:

Central nervous system depressant. Short-term sleep aid.

How the Drug Works:

Nonbarbiturate sedatives and hypnotics cause drowsiness to aid in falling asleep by acting on the central nervous system. They are less likely to cause slower pulse or breathing rate than barbiturate drugs.

Uses:

To treat insomnia for a short period of time (1 to 2 weeks). Long-term use is generally not recommended, and requires periodic medical evaluation.

Should sleeplessness persist, a drug-free interval of 1 or more weeks should elapse before retreatment is considered. An attempt should be made to find alternative nondrug therapy in chronic sleeplessness.

Paraldehyde—To quiet a patient and produce sleep in delirium tremens (DTs) and other psychiatric states characterized by excitement.

Chloral hydrate—To lessen anxiety and produce sleep before surgery. After surgery, chloral hydrate may be used with other medications to control pain.

To prevent or suppress alcohol withdrawal symptoms (rectal).

Unlabeled Uses: Occasionally doctors may prescribe ethchlorvynol as a sedative at doses of 100 mg to 200 mg 2 or 3 times daily.

Precautions:

Do not use in the following situations:

- allergy to the drug
- porphyria (ethchlorvynol and glutethimide only)
- pregnancy (benzodiazepines only)
- sleep apnea (quazepam only)

chloral hydrate only—

- gastritis
- heart disease, severe
- kidney disease
- liver disease

paraldehyde only—

- gastroenteritis
- liver disease
- lung disease
- peptic ulcer

Use with caution in the following situations:

- depression
- disease, preexisting (zolpidem only)
- drug addiction
- elderly or debilitated patients
- esophagitis (chloral hydrate only)
- gastritis
- impaired respiratory function (benzodiazepines and zolpidem only)
- kidney disease
- liver disease
- porphyria (chloral hydrate only)
- suicide attempt, history of
- ulcer, duodenal or gastric (chloral hydrate only)

Pregnancy: Adequate studies have not been done in pregnant women. Use only if clearly needed and potential benefits outweigh the possible hazards to the fetus.

Benzodiazepines—Do not use during pregnancy. The risk of use in a pregnant woman clearly outweighs any possible benefit.

Ethchlorvynol—Not recommended for use during the first and second trimesters of pregnancy. Use during the third trimester of pregnancy may produce symptoms in the newborn (eg, jitteriness, hyperactivity, restlessness, irritability, disturbed sleep, hunger).

Breastfeeding: Benzodiazepines, chloral hydrate and zolpidem appear in breast milk. It is not known if the other nonbarbiturate sedatives appear in breast milk. Consult your doctor before you begin breastfeeding.

Children: These drugs are generally not recommended for children.

Elderly: Use with caution. Elderly patients may be more sensitive to these drugs. There is a risk of oversedation, "morning hangover" (grogginess in the morning), dizziness and confusion. Dose may need to be reduced. See triazolam precaution.

Dependence: Long-term use may result in dependence. Withdrawal symptoms may occur when the drug is stopped.

Lab tests may be required during treatment with these drugs. Tests may include: Blood counts and liver and kidney function tests.

Triazolam: Short-term episodes of memory loss have been reported with the use of triazolam. Patients, especially the elderly, may become confused, disoriented and may attempt to wander after taking the drug. Upon waking in the morning, the patient may not remember the episode.

Ethchlorvynol: Patients who exhibit unpredictable behavior, restlessness or excitement in response to barbiturates or alcohol may react in this manner to ethchlorvynol. This drug should not be used for the management of sleep loss in the presence of pain, unless sleep loss persists after pain is controlled with pain relievers.

Tartrazine: Some of these products may contain the dye tartrazine (FD&C Yellow No. 5) which can cause allergic reactions in certain individuals. Check package label when available or consult your doctor or pharmacist.

Drug Interactions:

Tell your doctor or pharmacist if you are taking or if you are planning to take any over-the-counter or prescription medications with nonbarbiturate sedatives. Doses of one or both drugs may need to be modified or a different drug may need to be prescribed. The following drugs and drug classes interact with nonbarbiturate sedatives.

alcohol
barbiturates (eg, phenobarbital)
narcotic pain relievers

benzodiazepines only—
anticonvulsants (eg, carbamazepine)
antihistamines (eg, diphenhydramine)
cimetidine *(Tagamet)*
contraceptives, oral (eg, *Ortho-Novum*)
digoxin (eg, *Lanoxin*)
disulfiram (eg, *Antabuse*)
erythromycin (eg, *Ery-Tab*)
isocarboxazid *(Marplan)*
isoniazid (eg, *Laniazid*)
neuromuscular blocking agents
nicotine
phenelzine *(Nardil)*
phenothiazines (eg, chlorpromazine)
phenytoin *(Dilantin)*
probenecid (eg, *Benemid*)
rifampin (eg, *Rifadin*)
theophylline (eg, *Theo-Dur*)
tranylcypromine *(Parnate)*
troleandomycin *(Tao)*

chloral hydrate only—
anticoagulants, oral (eg, warfarin)
furosemide (eg, *Lasix*)
hydantoins (eg, phenytoin)

ethchlorvynol only—
anticoagulants, oral (eg, warfarin)

glutethimide only—
anticoagulants, oral (eg, warfarin)
charcoal

paraldehyde only—
disulfiram (eg, *Antabuse*)

Side Effects:

Every drug is capable of producing side effects. Many nonbarbiturate sedative users experience no, or minor, side effects. The frequency and severity of side effects depend on many factors including dose, duration of therapy and individual susceptibility. Possible side effects include:

Digestive Tract: Stomach pain or upset; vomiting; nausea; diarrhea; constipation; indigestion and appetite changes (zolpidem only).

Nervous System: Confusion; excitement; sleep problems (excessive dreaming or nightmares); drowsiness; dizziness; hallucinations (paraldehyde only); headache; anxiety; depression; hysteria (ethchlorvynol only); incoordination; decreased mobility; weakness; facial numbness; disorientation; incoherence; paranoid behavior (chloral hydrate only); zolpidem only—amnesia; nervousness; insomnia; euphoria; vertigo (feeling of whirling motion).

Circulatory System: Changes in blood pressure; abnormal blood counts.

Skin: Jaundice (yellowing of skin or eyes); rash; hives; itching; redness; skin and mucous membrane irritation (zolpidem and chloral hydrate only).

Other: Blurred vision; morning hangover (grogginess); unpleasant taste; unpleasant breath (paraldehyde only); dry mouth; fainting; sleepwalking (chloral hydrate only); prolonged hypnosis (ethchlorvynol only); upper respiratory infections and urinary tract infections (zolpidem only).

Body as a whole (zolpidem only): Allergy; back pain; chest pain; muscle aches; fatigue; flu-like symptoms.

Benzodiazepines only—

Digestive Tract: Heartburn; indigestion; appetite loss.

Nervous System: Nervousness; talkativeness; apprehension; irritability; euphoria (exaggerated sense of well being); relaxed feeling; tremor; lack of concentration; memory loss; sleeplessness; restlessness; tiredness; general body discomfort.

Circulatory System: Palpitations (pounding in the chest); chest pain; heart rhythm disturbances.

Other: Ringing in the ears; impairment of the senses; abnormal sensations; sore throat; congestion; joint pain; cramps/pain; stiffness.

General Guidelines for Use:

- May cause drowsiness or dizziness. Use caution while driving or performing other tasks requiring mental alertness, coordination or dexterity.
- Avoid alcohol and other drugs which cause drowsiness (eg, pain relievers, sedatives).
- Do not exceed prescribed dosage.
- May be habit forming. Do not discontinue drug abruptly, especially if you have a history of seizures, regardless of other antiseizure medications you may be taking.
- Contact your doctor if visual changes, irregular heartbeats, chest pains, yellowing of skin or eyes, rash or unusual bleeding or bruising occurs.

Guidelines For Individual Dosage Forms:

- *Benzodiazepines*—Nighttime sleep may be disturbed for 1 or 2 nights following stopping of the drug.
  May cause morning drowsiness, unusual tiredness in the morning or daytime sleepiness after using these medications for sleep. Awakening in the early morning may occur with temazepam and triazolam.
  Triazolam may cause short-term memory loss (see Precautions).
  Inform your doctor if you are planning to nurse or to become pregnant or if you become pregnant while taking this medication.
- *Chloral hydrate*—May cause stomach upset. Take capsules with a full glass of water or fruit juice.
  Swallow capsules whole—do not chew.
  Dilute syrup in a half glass of water, ginger ale or fruit juice.
- *Ethchlorvynol*—Symptoms of giddiness, incoordination and stomach upset may be reduced if medication is taken with food.
- *Glutethimide*—Contact your doctor if rash occurs.
- *Paraldehyde*—May cause stomach upset. Take with food or mix with milk or iced fruit juice to improve taste. Paraldehyde is irritating to the lining of the digestive tract and must be well diluted.
  Do not use paraldehyde in any plastic container. Do not dispense with a plastic spoon or syringe.
  Discard any unused paraldehyde after opening bottle.
  Do not use if liquid has a brownish color or a strong vinegar odor.
  Has a strong odor in exhaled air for as long as 24 hours after ingestion. The patient is often unaware of the odor.
  Storage—Upon exposure to light and air, paraldehyde decomposes. Keep away from heat, open flame or sparks. Paraldehyde solidifies at approximately 54°F and must be liquefied before use. Do not store in direct sunlight or expose to temperatures above 77°F. Keep product covered in box until use. Do not use paraldehyde from a container that has been opened for longer than 24 hours.
- *Triazolam*—Do not take when a full night's sleep and elimination of the drug from the body are not possible before the need to be active and functional.

If you have questions concerning sedative hypnotics, consult your pharmacist or doctor.

About Your Medicine: Ventolin Inh.

Adrenergic bronchodilators are inhaled (breathed in) to treat asthma, bronchitis, emphysema, and other lung diseases.

Before Using This Medicine:

Read the label. Be very careful if you:

- have allergies.
- are pregnant or plan to become pregnant.
- are breast-feeding.
- are taking **any** other medicine, including those you buy yourself such as aspirin or cold medicine
- have **any** other medical problems.
- use cocaine or have used it in the past.

Proper Use of This Medicine:

Use this medicine exactly the way your doctor told you.

Precautions While Using This Medicine:

Warning:

- This medicine may come with patient directions. Read them carefully before you use the medicine.
- **If you use this medicine and you still have trouble breathing or your condition gets worse, check with your doctor right away.**
- **Do not use epinephrine without a doctor's prescription unless your doctor told you that you have asthma.**
- **Do not use epinephrine, isoetharine, isoproterenol, or racepinephrine solution if it becomes cloudy or turns pinkish to brownish in color.**
- **If you are using the inhalation aerosol form of this medicine: -- Keep spray away from your eyes. -- Do not take more than 2 inhalations at one time** unless your doctor gave you other directions. Wait 1 or 2 minutes after the first inhalation to see if you need a second inhalation. -- Save your applicator. Refill units may be available. -- Store away from heat and sunlight. Do not puncture, break, or burn the container, even if it is empty.
- **Do not use the inhalation aerosol form of this medicine and an adrenocorticoid or ipratropium inhaler at the same time. Wait 5 minutes between using the 2 medicines unless your doctor gave you other directions.**
- **If you are using this medicine regularly and you miss a dose, use it as soon as possible. Then space the same amount of time between the other doses for that day. Do not double doses.**
- **If you think you may have taken an overdose of this medicine, check with your doctor.**
- **Do not give any of your medicine to others. It may hurt them.**
- **Do not leave this medicine where children can get it.**

Possible Side Effects of This Medicine:

Tell your doctor **right away** if you notice any of these possible side effects:

Bluish coloration of skin; dizziness (severe) or feeling faint; flushing or redness of face or skin (continuing); increased wheezing or difficulty in breathing; skin rash, hives, or itching; swelling of face, lips, or eyelids

Also tell your doctor about these other possible side effects:

Rare -- Chest discomfort or pain; irregular heartbeat; numbness in hands or feet; unusual bruising

With high doses -- Hallucinations

Possible signs of overdose -- Dizziness (severe); fast, slow, irregular, or pounding heartbeat (continuing); headache (continuing or severe); increase or decrease in blood pressure (severe); nausea or vomiting (continuing or severe); weakness (severe)

Some side effects are not serious. However, tell your doctor if these bother you or do not go away:

More common -- Nervousness or restlessness; trembling

Atrovent Inh

out Your Medicine:

ratropium (i-pra-TROE-pee-um) is inhaled (breathed in) to control the symptoms of lung diseases, ich as chronic bronchitis and emphysema. Ipratropium may also be used for other conditions.

fore Using This Medicine:

ll your doctor, nurse, and pharmacist if you:
- have allergies.
- are pregnant or plan to become pregnant.
- are breast-feeding.
- are taking **any** other medicine, including those you buy yourself such as aspirin or cold medicine
- have **any** other medical problems.

oper Use of This Medicine:

e this medicine:
- **exactly the way your doctor told you.**

ecautions While Using This Medicine:

rning:
- This medicine usually comes with patient directions. Read them carefully.
- For patients who are using ipratropium inhalation aerosol: -- If your doctor told you to use more than 1 inhalation of this medicine for each dose, wait 1 minute between the inhalations. -- If you are also using another bronchodilator inhalation aerosol, use it first. Then wait about 5 minutes before you use ipratropium inhalation aerosol, unless your doctor gave you other directions. -- If you are also using an adrenocorticoid inhalation aerosol or cromolyn inhalation aerosol, use the ipratropium inhalation aerosol first. Then wait about 5 minutes before you use the other medicine unless your doctor gave you other directions.
- For patients who are using ipratropium inhalation solution: -- If you are using ipratropium inhalation solution in a nebulizer, make sure you know how to use it. Ask your doctor or pharmacist about this. -- **If you are also using cromolyn inhalation solution, do not mix it together with the ipratropium inhalation solution for use in a nebulizer.**
- **Keep the spray or solution away from your eyes.**
- **If you miss a dose of this medicine**, use it as soon as possible. However, if it is almost time for your next dose, skip the missed dose. **Do not double doses.**
- **If you use a dose of this medicine and your symptoms do not get better within 30 minutes or if your condition gets worse, check with your doctor right away.**
- **If you have dry mouth that lasts for more than 2 weeks, check with your doctor or dentist.**
- **If you think you may have taken an overdose of this medicine, check with your doctor.**
- **Do not give any of your medicine to others. It may hurt them.**
- **Do not leave this medicine where children can get it.**

ssible Side Effects of This Medicine:

ll your doctor if you notice any of these possible side effects:

are -- Skin rash or hives; ulcers or sores in mouth and on lips

me side effects are not serious. However, tell your doctor if these bother you or do not go away:

ore common -- Cough or dryness of mouth or throat; headache or dizziness; nervousness; stomach set or nausea

so tell your doctor if you have any other side effects.

Appendix 13

Medication Calendar

MEDICATION CALENDAR

Investigators: Trevor Sullivan, M.A. Program
Leslie McDonald-Miszczak, Ph.D

Home Phone (Trevor): 346-2296

Lab Phone: 346-7704

Lab Address: BB 1067D

Week 2 (Telephone Interview)

Date: _____ **Time:** _____

Week 3 (Home Visit)

Date: _____ **Time:** _____

Week 4 (Telephone Interview)

Date: _____ **Time:** _____

Week 5 (Final Interview)

Date: _____ **Time:** _____

Appendix 14

Refill Questionnaire

ID_____

Visit #_____

Refill Questionnaire (Weeks 1 -4)

Over the course of the next half-hour or so, you'll be asked to answer 2 questionnaires. The first questionnaire has 15 items involving your experience with the medication regimen during the past week. Some questions will require you to use a rating scale in order for you to provide an answer. In these situations, carefully look over the relevant scale and choose the most appropriate rating pertaining to you. In regards to the second questionnaire, there will be 2 questions which you will be required to complete confidentially. If you have any questions at any time, please feel free to ask for assistance.

For question #1 and #2, choose the percentage value which best pertains to your compliance during the last week (question #1) or yesterday (question #2). You may choose any number between 0 and 100. Don't feel as if you have to use the numbers listed on the line, as these number are only there to help explain the scale. Choose the best number value which pertains to you (for example, 80%, 75%, 67%, etc.).

1. How would you rate your compliance with your medication regimen over the **last week**?

|_____|_____|_____|_____| _____%

100% 75% 50% 25% 0%

2. How would you rate your compliance with your medication regimen **yesterday**?

|_____|_____|_____|_____| _____%

100% 75% 50% 25% 0%

For question #3, circle "Yes" or "No", depending on which answer best pertains to you.

3. Did you incorporate any specific strategies that help you to remember to take your medications?

(Yes / No)

If you answered "Yes" or "No" to the above question, read over the different strategies listed beside letters "a, b, c, d, e, f, g, h, and i" and circle "Yes" if you used this strategy or "No" if you didn't use the strategy. If you circled "Yes", then estimate what percentage of the time during the last week that you used this strategy to help you remember to take your medication.

a. Make a **list** of all medications, including correct times and contexts.

(Yes / No) _____%

b. **Mentally rehearse** the medication regimen at the beginning of the day.

(Yes / No) _____%

d. Leave medication in **familiar spots** so you won't forget them.

(Yes / No) ____%

e. Look back at the day **retrospectively** to remember if you took your medication.

(Yes / No) ____%

f. **Concentrate** extra hard on remembering to take medication correctly.

(Yes / No) ____%

g. Write **reminder notes** for yourself.

(Yes / No) ____%

h. Put all of your pills into **one bottle** when leaving the house.

(Yes / No) ____%

I. **Other**_____

(Yes / No) ____%

Note: if participant states more than one strategy, ask the following two questions:

Which strategy did you use the most? _____

Which strategy was most effective? _____

4a. Did you find that your medication compliance has changed during the last **week?**
(Yes / No)

b. Has your compliance improved or declined? _____

c. How much has your compliance improved/declined? _____%

5a. How complex did you find the medication regimen?

(Extremely Complex / Very Complex / Moderately Complex /

Mildly Complex / Not Complex)

b. If so, what primarily did you find complex about the regimen?

_____

_____

_____

_____

6a. How difficult did you find it to incorporate your medication regimen into your daily schedule (i.e., inconvenient)?

(Extremely Difficult / Very Difficult / Moderately Difficult /

Mildly Difficult / Not Difficult)

b. If so, what primary facet of the regimen was of particular inconvenience?

_____

_____

_____

_____

7a. How often did you have problems remembering to take specific medications in conjunction with one another.

(Always / Often / Sometimes / Rarely / Never)

b. If so, which medication combination(s) is posed a problem and what was the primary obstacle which prevented you from taking your medication?

8a. Are there any specific situations that made it difficult for you to take your medication correctly?

(Yes / No)

b. If so, describe the primary situation(s).

9a. How often did you forget to take your pills when you are at home?

(Always / Often / Sometimes / Rarely / Never / Not Applicable)

b. If so, what was the primary reason that caused you to forget to take your pills when you are at home?

10a. How often did you forget to use your puffers when you are at home?

(Always / Often / Sometimes / Rarely / Never / Not Applicable)

b. If so, what was the primary reason that caused you to forget to use your puffers when you are at home?

_____

_____

_____

_____

11a. How often did you forget to bring your pills with you when you left home?

(Always / Often / Sometimes / Rarely / Never / Not Applicable)

b. If so, what was the primary reason that caused you to forget to bring your pills with you when you left home?

_____

_____

_____

_____

12a. When you remembered to bring your pills with you when you left home, how often did you forget to take them?

(Always / Often / Sometimes / Rarely / Never / Not Applicable)

b. If so, what was the primary reason that caused you to forget to take your pills when you left home?

13a. How often did you forget to bring your puffers with you when you left home?

(Always / Often / Sometimes / Rarely / Never / Not Applicable)

b. If so, what was the primary reason that caused you to forget to bring your puffers with you when you left home?

14a. When you remembered to bring your puffers with you when you left home, how often did you forget to use them?

(Always / Often / Sometimes / Rarely / Never / Not Applicable)

b. If so, what was the primary reason that caused you to forget to use your puffers when you left home?

15a. Have you started to take any new medications since beginning participation in this study (i.e. prescribed medication for an illness)?

(Yes / No)

Note: if participant answers "yes" above, ask the following questions:

How many new medication(s) are you presently taking? _____ **medications**

How many times daily are you required to take each medication(s)?

_____

_____

_____

_____

_____

In your best estimate, how long will you be required to take these medication(s)

_____ **days / weeks / months**

Post-Refill Interview Questions

1. Describe your typical daily medication regimen.

2a. Does your typical medication regimen vary significantly from day-to-day?

(Yes / No)

b. If so, how does your typcial medication regimen vary significantly from day-to-day?

3. How many pills/stickers of each medication have you taken so far today?

Appendix 15

Confidential Questionnaire

ID_____

Visit #_____

Confidential Questions for Refill and Final Interview

In this questionnaire, I would like you to answer a few questions involving your attitude towards the medication regimen. Please take your time and answer each of these questions to the best of your ability. Avoid signing your name on this questionnaire as it is important to preserve your anonymity. When you have completed the questionnaire, place it in the envelope and seal it. I won't be looking at this questionnaire until the end of the study, so please provide honest answers. If you have any questions at any time, please feel free to ask for assistance.

16. Did you experience any days where you purposely chose not to take any medication? **(Yes / No)**

    If you answered "yes", what were your reason(s) for doing so? (circle all that apply)

    a. Too busy to take medication.
    b. Didn't feel like taking medication.
    c. Find myself losing interest in the study.
    d. Encountered personal problems.
    e. Had a bout with illness.
    f. Other_____

    How many days or parts of days, did you choose not to take your medication since our last meeting one week ago?

    Note: you can use partial days (i.e., .5 or .25 if appropriate). _____ **days**

17a. Since the last time we met, how important is it for you to remember to take your medication correctly for the purposes of this study?

    a. Extremely Important
    b. Very Important
    c. Moderately Important
    d. Mildly Important
    e. Not Important

b. Why was it important or not important for you to remember to take your medication correctly?

Note: please write or print very clearly.

_____

_____

_____

_____

Appendix 16

Time-Based Prospective Memory Task

Time-Based Prospective Memory Task

Note: this task is to be presented at the end of the Refill Visit (Week 2).

This should just about wrap-up our meeting. The next meeting will be held at your house for about 30 minutes (Home Visit - Week 3). As I mentioned earlier, it is important to confirm every meeting in order to keep the medication schedule consistent and ensure that you don't run out of medication. Unfortunately, I will be unable to call you the day before our meeting to confirm as I will be out of town. For the next little while, I'll be at my family cottage in Esker Lake and I'm afraid we don't have a phone. So, I was wondering if you could phone the SALT lab sometime between 9:00 a.m. and 1:00 p.m. and leave a message on the answering machine to confirm the meeting. When you phone the lab, just leave your name and confirm the time of our meeting for the next day. Also, I should mention that it is very important that you phone between 9:00 a.m. and 1:00 p.m. as there will be testing going on in the lab shortly after 1:00 p.m.. When this happens, the telephone ringer may interrupt another testing session. Thank you and I'll see you next time.

Note: Make new message on answeing machine for Week 2

Note: Put sign on telephone to not answer it between 9:00a.m. - 1:00 p.m.

Note: Phone participant back at 4:00 p.m. to confirm the meeting

Return-Call Message

Hi, this is Trevor Sullivan. I'm just calling to confirm our meeting for tomorrow. Fortunately, I got back from my trip earlier than I anticipated. I'm looking forward to meeting you tomorrow at **(say time)**. See you then!

Appendix 17

Rating Questionnaire

ID_____

Rating Questions for Final Interview

The following questionnaire asks that you read each of the questions carefully and rate your recall for each specific question. For example, in question #18, you are asked to rate how well you remember what each specific medications is designed to treat. This answer is to be rated on a scale ranging from 0% (none of the medications) - 100% (all of the medications). Below question 18 there is a glossary explaining what each rating represents. Don't feel as if you have to choose one of the suggested ratings. If another rating is more appropriate, select that one. When you have finished rating the question, write your answer in the blank space provided (next to the % sign).

18. Do you remember what each specific medication is designed to treat?

|_____|_____|_____|_____| _____%

100% 75% 50% 25% 0%

100% - I remember what **all** of the medications are designed to treat.
75% - I remember what **most** of the medications are designed to treat.
50% - I remember what **half** of the medications are designed to treat.
25% - I remember what **some** of the medications are designed to treat.
0% - I remember what **none** of the medications are designed to treat.

19. Do you remember how many times daily each specific medication is to be taken?

|_____|_____|_____|_____| _____%

100% 75% 50% 25% 0%

100% - I remember how many times daily **all** of the medications are to be taken.
75% - I remember how many times daily **most** of the medications are to be taken.
50% - I remember how many times daily **half** of the medications are to be taken.
25% - I remember how many times daily **some** of the medications are to be taken.
0% - I remember how many times daily **none** of the medications are to be taken.

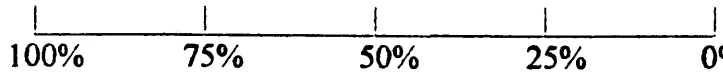
20. Do you remember the amount of each specific medication that is to be taken daily?

|_____|_____|_____|_____| _____%

100% 75% 50% 25% 0%

100% - I remember the amount of **all** medications that are to be taken daily.
75% - I remember the amount of **most** of the medications that are to be taken daily.
50% - I remember the amount of **half** of the medications that are to be taken daily.
25% - I remember the amount of **some** of the medications that are to be taken daily.
0% - I remember the amount of **none** of the medications that are to be taken daily.

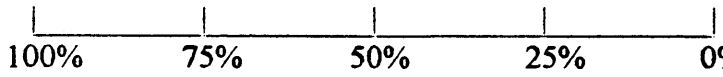
21. Do you remember which medications are to be taken in conjunction with one another?



_____%

100% - I remember **all** of the medications that are to be taken in conjunction with one another.
75% - I remember **most** of the medications that are to be taken in conjunction with one another.
50% - I remember **half** of the medications that are to be taken in conjunction with one another.
25% - I remember **some** of the medications that are to be taken in conjunction with one another.
0% - I remember **none** of the medications that are to be taken in conjunction with one another.

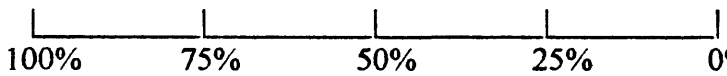
22. Do you remember the context in which each medication is to be taken (i.e. with water)?



_____%

100% - I remember the context in which **all** of the medications are to be taken.
75% - I remember the context in which **most** of the medications are to be taken.
50% - I remember the context in which **half** of the medications are to be taken.
25% - I remember the context in which **some** of the medications are to be taken.
0% - I remember the context in which **none** of the medications are to be taken.

23. Do you remember the side effects associated with each medication?



_____%

100% - I remember the side effects associated with **all** of the medications.
75% - I remember the side effects associated with **most** of the medications.
50% - I remember the side effects associated with **half** of the medications.
25% - I remember the side effects associated with **some** of the medications.
0% - I remember the side effects associated with **none** of the medications.

Appendix 18

Recall Questionnaire

ID_____

Recall Questions for Final Interview

Now that we have completed the 5 week study, I would like you to provide as many details about your medication regimen as possible. Don't worry if you cannot remember all the details of your regimen, but please take your time and try your best. Also, don't worry about spelling or even recalling all of the details perfectly. It is great if you can do this, but it is just as important to provide us with as many details as possible (even incomplete ones). For the remaining questions, you are asked to provide a detailed response. Please write or print very clearly. You may ask for additional paper if you need it. Remember, provide as many details as possible, even if they are incomplete.

24.. Please name as many of your medications as possible and describe the condition that each medication is designed to treat.

_____

_____

_____

_____

_____

_____

_____

25. Please list how many times daily each specific medication should be taken.

Note: if you cannot recall the names of medications use numbers to differentiate between them.

26. Please describe the amount of each medication that is to be taken daily?

27. Please describe the medication combinations that are to be taken in conjunction with one another.

28. Please describe the context in which each medication should be taken (i.e., with water, with food, etc.).

29. Please list major side effects associated with each individual medication.

Note: please be specific about which side effects coincide with each individual medication.

_____

_____

_____

_____

_____

_____

_____

Thank you for your participation!

Appendix 19

Debriefing Sheet

Debriefing

Some estimates suggest that 30 - 45% of older adults do not take their medication correctly (Isaac, Tamblyn, & McGill-Calgary Drug Research Team, 1993). The implications for older adults' health and the cost of health care due to complications is enormous. Are the elderly simply forgetting to take their medication or are there other factors which contribute to poor medication compliance?

This study examines the self-reported medication compliance and the actual compliance behaviours of a younger sample of university students and older participants in order to examine (a) changes in self-reports and compliance behaviour over a short-term period, (b) concordance between such self-assessment and actual compliance behaviours over time, and (c) the amount and types of medication information that individuals recall after they have been participating in a medication program for some time. Assessing both self-reports and actual compliance behaviours is very important. The two measures do not agree (often we underestimate or overestimate our compliance). Given that self-reported compliance is the measure used by physicians to modify regimens, examination of such inaccuracy is important to adults' physical well-being.

To understand the relation between our self-reported compliance rates and our memory ability, we asked you to perform a variety of memory tasks 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 in the top right-hand corner, (b) tell the researcher when 20 minutes had elapsed, so that he could receive a phone call, and (c) telephone the SALT lab and leave your name on the answering machine in order to confirm

the meeting for Week 3 (Home Visit). The tasks were actually a planned portion of the experiments 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, remember to take your next pill in 20 minutes, or phone the SALT lab to receive a refill for your medication). 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.

You were also asked to perform several other memory tasks. These included: matching the appropriate symbol with the appropriate number, remembering word pairs and making a prediction on how many you thought you could remember, and looking at a series of sentences on flash cards and making new sentences from the underlined words. The reason that we asked you to perform these tasks is because we feel that your performance on these tasks may be related to performance on the medication regimen.

We asked you to participate in this study for a period of four weeks because most studies of medication compliance completed to date have not taken place over a period of weeks. Let's face it, our compliance with our medications changes as we become more accustomed to our medication regimen (sometimes we develop strategies to help our compliance so it improves, and sometimes our compliance gets sloppy with time). We asked healthy older adults to participate in this study to closely examine the effects of memory and regimen complexity on self-reports and actual compliance.

Before you leave, I would like to ask you to please not say anything at all about this study to anyone. If people who are still participating in this study hear about it, they may start forming some expectations about it and this may influence their answers to the questionnaires.

So, regardless of the temptation, could you promise not to discuss this study with anyone to ensure its success? Do you have any questions?

Would you like to tell me your address so I can send you a copy of the study's results? The study and the analysis will take some months to complete, but we would like to tell you about the findings. Thank you very much for your participation. It has been invaluable.

Medication Compliance Questions

1. What is the paradox that exists concerning older adults' cognitive abilities and their medication regimens?

2. Why study younger adults' "medication-taking" behaviours to address this issue in an older group?

Figure 1.

Self-Reported Compliance Ratings of Young Adults over Time

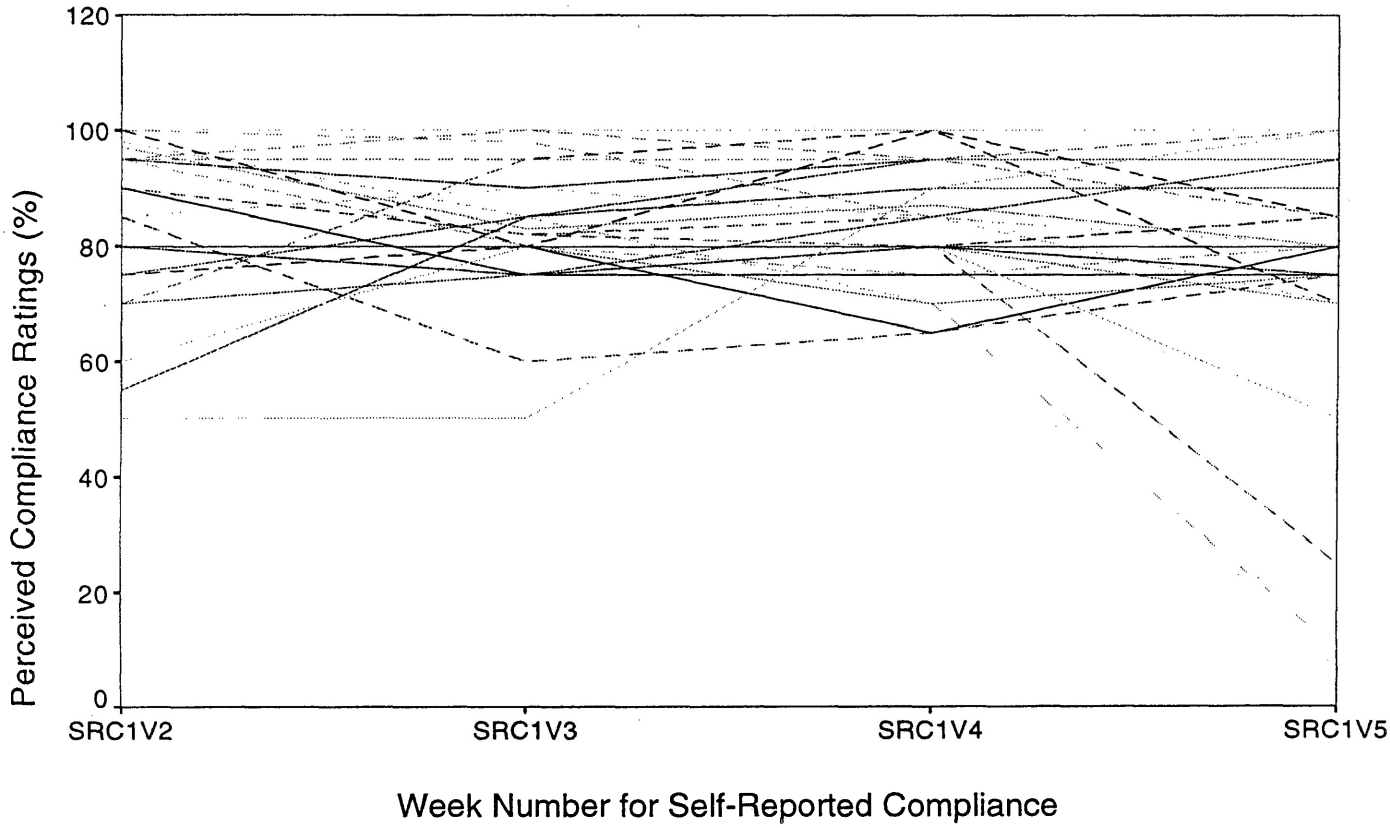


Figure 2.

Self-Reported Compliance Ratings of Older Adults over Time

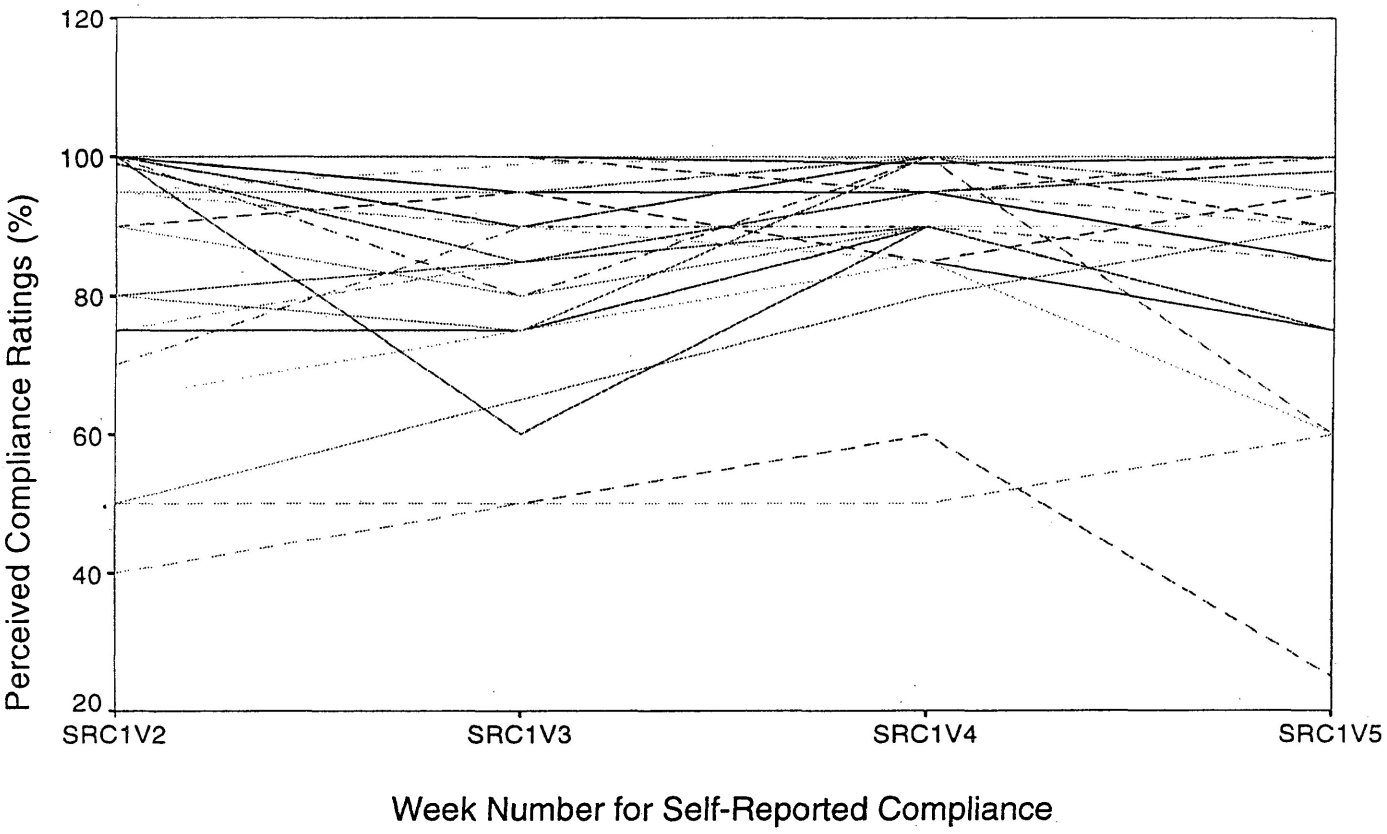


Figure 3.

Actual Compliance Ratings of Young Adults over Time

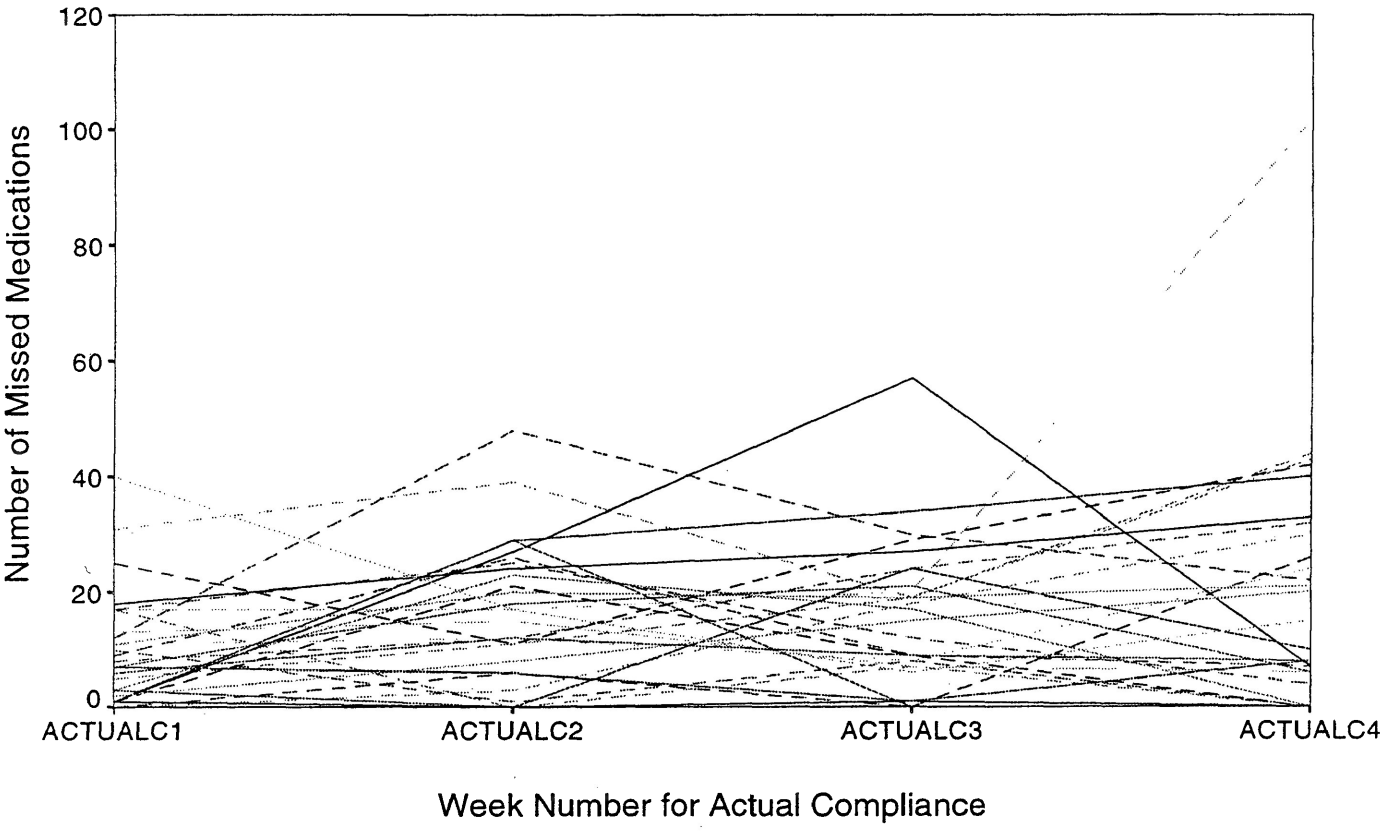


Figure 4.

Actual Compliance Ratings of Older Adults over Time

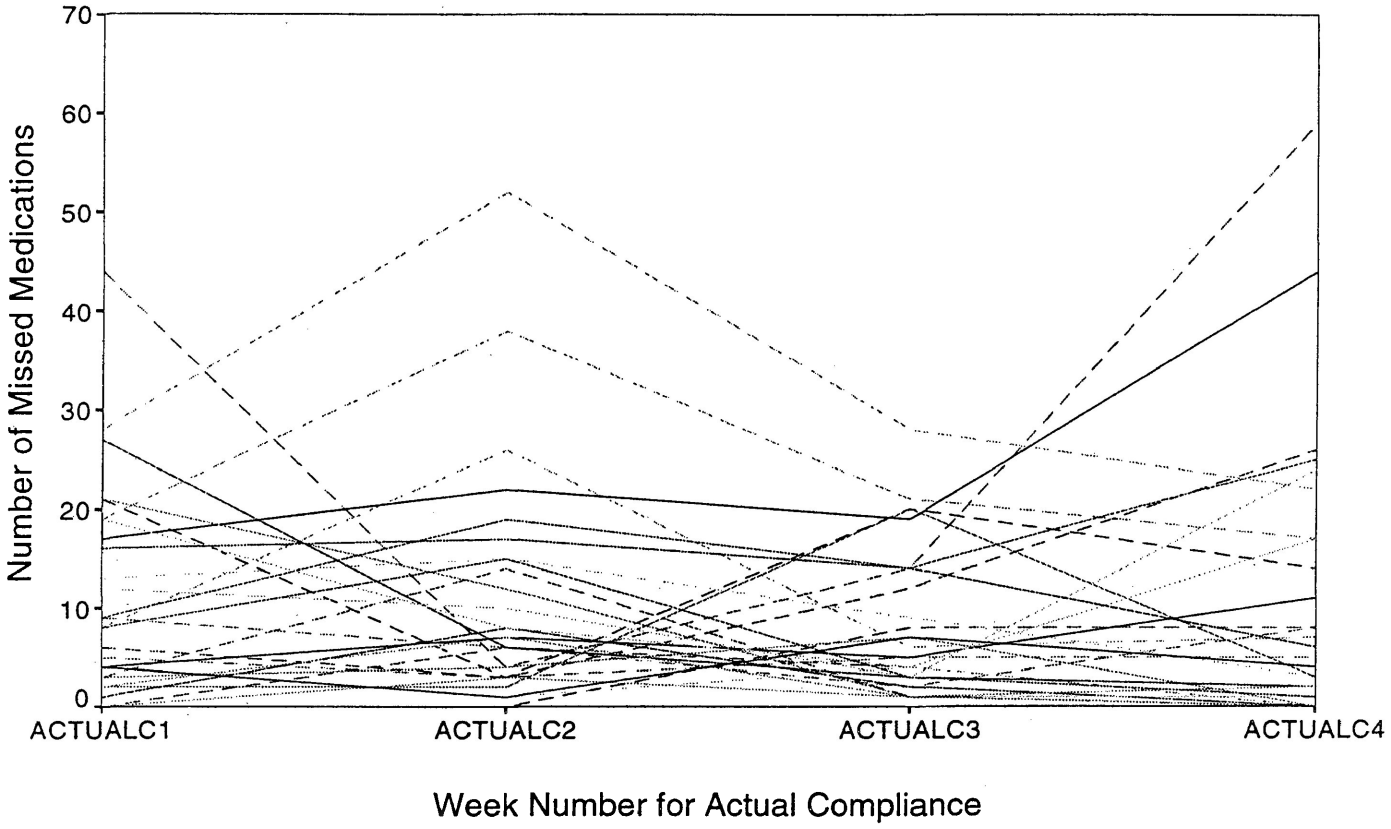


Table 1

Means and standard deviations for Young and Older Adults on Demographic Variables, Mood, and Memory Beliefs

Variable	Young Adults (n=30)	Older Adults (n=30)	t-value
PIQ			
Daily social activities	3.93(0.25)	3.93(0.25)	0.00
Perceived Overall State of Health	1.97(0.85)	1.63(0.72)	1.64
Perceived State of Health Compared With Peers	2.23(0.86)	1.50(0.57)	3.89***
Yearly Visits to Family Physician	2.80(1.03)	2.67(0.84)	0.55
Number of Prescribed Medications in Last Two Years	2.23(0.94)	1.93(0.58)	1.49
CES-D	32.07 (8.06)	26.13 (6.61)	3.12**
MIA			
Anxiety	39.00 (6.93)	40.27 (6.85)	-0.71
Internal Strategy Use	21.40(3.23)	21.80(3.63)	-0.45
External Strategy Use	25.57(6.84)	20.47(6.40)	2.98**
Capacity Subscale	55.67 (7.11)	54.17 (8.44)	0.74

Note. *p<.05. **p<.01. ***p<.001. PIQ = Personal Information Questionnaire. CES-D = Centre for Epidemiology Depression Scale. MIA = Metamemory in Adulthood Questionnaire. Higher scores on Personal Information variables indicate more daily social activity, lower perceptions of overall health when compared to a perfect state of health, lower perceptions of overall health when compared to peers, more yearly visits to family physician, and greater number of prescribed medications in the last two years. Higher scores on Depression Questionnaire (CES-D) indicate higher levels of depression. Higher scores on Metamemory in Adulthood Questionnaire (MIA) indicate lower levels of anxiety (Anxiety Scale), increased use of internal strategies (Internal Strategy Scale), increased use of external strategies (External Strategy Scale), and lower levels of self-efficacy (Self-Efficacy Scale).

Table 2

Means and standard deviations for Young and Older Adults on Self-Reported Compliance Ratings and Actual Compliance Scores

Variable	Young Adults (n=30)	Older Adults (n=30)	t-value
Self-Reported Compliance Ratings	330.73 (37.73)	351.33 (55.14)	-1.69
Actual Compliance Scores	60.83 (38.08)	39.07 (34.18)	2.33*

Note. *p<.05. **p<.01. ***p<.001. Higher scores on Self-Reported Compliance Rating indicate higher perceived ratings of compliance. Higher scores on Actual Compliance indicate superior compliance performance.

Table 3

Means and standard deviations for Young and Older Adults on Self-Reported Compliance and Actual Compliance Intercept and Slope Values

Variable	Young Adults (n=30)	Older Adults (n=30)	t-value
Intercepts			
Self-Reported Compliance	82.68 (9.43)	87.83 (13.78)	-1.69
Actual Compliance	15.21 (9.52)	9.77 (8.54)	2.33*
Slopes			
Self-Reported Compliance	-1.26 (8.21)	0.34 (4.40)	-0.94
Actual Compliance	2.64 (6.77)	-0.22 (3.57)	2.04*

Note. *p<.05. **p<.01. ***p<.001. Higher scores on Intercept Values indicate a higher starting point for self-reported compliance and actual compliance scores. Higher scores on Slope Values indicate greater change over time for self-reported compliance and actual compliance scores.

Table 4

Predictors of Self-Reported and Actual Compliance Intercept Values for Young and Older Adults

	Intercept					
	EBPM	TBPM	DS	SC	SPT	R^2
Self-Reported Compliance						
All Subjects Combined						
Pearson r	.125	.079	-.236	.068	.032	14.40
Semi-partial correlation	.225	.058	-.349	.032	.077	
Young Adults						
Pearson r	.301	.198	-.224	.009	.163	23.37
Semi-partial correlation	.320	.184	-.324	.007	.106	
Older Adults						
Pearson r	.171	.029	-.085	.045	.136	8.26
Semi-partial correlation	.189	-.032	-.221	.006	.119	
Actual Compliance						
All Subjects Combined						
Pearson r	.019	-.113	.176	-.056	.045	5.66
Semi-partial correlation	-.047	-.122	.186	-.056	.005	
Young Adults						
Pearson r	.064	-.107	-.010	.010	-.150	5.08
Semi-partial correlation	.093	-.109	.015	.120	-.178	
Older Adults						
Pearson r	-.182	-.174	.012	-.150	.049	8.05
Semi-partial correlation	-.156	-.138	.115	-.127	.044	

Note. EBPM = Event-Based prospective memory. TBPM = Time-based prospective memory. DS = Digit Symbol. SC = Sentence Construction. SPT = Subject-performed task. The semi-partial correlations were derived from regression equations with simultaneous entry of all memory predictors.

Table 5

Predictors of Self-Reported and Actual Compliance Slope Values for Young and Older Adults

	Slope					
	EBPM	TBPM	DS	SC	SPT	R2
Self-Reported Compliance						
All Subjects Combined						
Pearson r	-.350	-.039	-.204	-.145	-.087	14.67
Semi-partial correlation	-.297	.031	-.077	-.114	.122	
Young Adults						
Pearson r	-.400	-.074	-.214	-.148	.026	22.78
Semi-partial correlation	-.381	.022	-.158	-.202	.171	
Older Adults						
Pearson r	-.369	.044	-.116	-.169	-.144	16.52
Semi-partial correlation	-.348	.134	.085	-.062	.016	
Actual Compliance						
All Subjects Combined						
Pearson r	.222	.169	.279	.074	.094	11.13
Semi-partial correlation	.101	.124	.211	.034	-.098	
Young Adults						
Pearson r	.067	.261	.197	.168	-.211	24.80
Semi-partial correlation	.048	.212	.186	.276	-.381	
Older Adults						
Pearson r	.308	-.011	.131	-.112	.275	19.48
Semi-partial correlation	.265	-.113	-.040	-.254	.199	

Note. EBPM = Event-Based prospective memory. TBPM = Time-based prospective memory. DS = Digit Symbol. SC = Sentence Construction. SPT = Subject-performed task. The semi-partial correlations were derived from regression equations with simultaneous entry of all memory predictors.

Table 6

Means and standard deviations for Young and Older Adults on Perceptions of Recall and Actual Recall of the Medication Regimen

Variable	Young Adults (n=30)	Older Adults (n=30)	t-value
Perception of Recall Score	442.17 (74.68)	405.67 (122.32)	1.39
Actual Recall Score	28.08 (4.50)	24.17 (7.40)	2.48*

Note. *p<.05. **p<.01. ***p<.001. Higher scores on Perception of Recall indicate higher perceived recall of medication regimen. Higher scores on Actual Recall indicate higher actual recall of medication regimen.