HORMONE REPLACEMENT THERAPY USE

AND

EVERYDAY MEMORY IN MID-AGED

NEW ZEALAND WOMEN

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Hormone Replacement Therapy Use and Everyday Memory in Mid-Aged New Zealand Women

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ABSTRACT

There continues to be inconsistent evidence as to the extent that Hormone Replacement Therapy (HRT) may preserve memory performance in menopausal women. The Rivermead Behavioural Memory Test-Extended Version (RBMT-E) is a new measure of everyday memory developed for normal populations. The RBMT-E was used to test the everyday memory in a sample of 104 mid-aged New Zealand women (53 HRT users & 51 non-users). Measures of mood, affect, stress, general health and menopausal symptoms as well as age and education were also taken to control for possible confounds. Results showed significant differences ($p< 0.5$) between the groups for three sub-tests: 'Story Immediate', 'Story Delayed', and 'Message Delayed'. After calculation of a total profile score and adjustments for age and IQ, HRT users scored more highly than non HRT users on the RBMT-E overall measure of Everyday Memory. Conclusions suggest that HRT use does show a relationship with verbal memory, and that the potentially beneficial effect may assist in the performance of everyday memory tasks.

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CHAPTER 1

INTRODUCTION

This study investigates the possible relationship between Hormone Replacement Therapy (HRT) and the everyday memory performance of mid-aged women. Building on a neuroscientific platform that has demonstrated a positive effect of hormone replacement on memory in animals, there is now supportive evidence of a similar effect on verbal memory in mid-aged menopausal women. In addition, more recent research has suggested that the effect of hormone replacement may extend to other aspects of memory.

Menopause is a transition period that occurs in all women at mid-age, and in addition to the loss of natural estrogen and the cessation of periods, is associated with various symptoms including complaints of memory loss. Hormone Replacement therapy is advocated by medical professionals as a compensation for the lack of estrogen, and for the alleviation of accompanying symptoms. The medicalisation of menopause and the subsequent prescription of HRT is not without controversy. The inconsistent and often contradictory findings of studies that have endeavoured to unravel the nature of the HRT effect, have extended this controversy.

Alongside this evolution has emerged a continuing debate as to how memory should be measured. Questions about the validity of naturalistic versus laboratory research have highlighted the difficulty in obtaining memory measures that accurately portray how an individual may perform in everyday life. With the suggestion that the effect of hormone replacement may extend to other aspects of memory, it follows that there is need to ensure that such a measure accurately reflects how women's memory functions in everyday experience.

The Rivermead Behavioural Memory Test is designed to be an ecologically valid measure of everyday memory and has proven reliability and validity. The Rivermead has recently been further developed to create an extended version that is said to allow the assessment of 'normal, younger, individuals'. The present study utilises the Rivermead Behavioural Memory Test-Extended Version, to investigate the relationship of HRT with everyday memory performance in mid-aged New Zealand women.

Chapter 2 of this thesis examines the evidence for a relationship between memory and HRT. Chapter 3 describes the current understanding of the constructs of memory, including the concept of everyday memory. Next, how memory has been measured is discussed. The relationship of memory to menopause follows, with a description of the many confounding variables such as age, education, health, sleep, stress and mood that have often made it difficult to clarify the role HRT may play in memory performance. Chapter 4 describes the formulation and design of the project and outlines the specific hypotheses tested.

CHAPTER 2

THE EVIDENCE FOR A RELATIONSHIP BETWEEN MEMORY AND HORMONE REPLACEMENT THERAPY

The review of the evidence for a relationship between memory and hormone replacement therapy commences with support from the field of neuroscience. Highlights of recent findings from this arena have set the stage for past, and present investigations of whether memory is maintained by estrogen. Our current understanding of menopause, and the hormonal changes that accompany it are described next. A review of the research regarding hormone replacement therapy (HRT) follows and this includes evidence for the benefits of HRT, (those well established and those still inconsistent and contradictory), as well as the recognised risks and contraindications for particular women. Over the past decade, research has endeavoured to establish that the estrogen loss associated with menopause does indeed impair aspects of memory. In addition, research findings that HRT users often exhibit a better performance in memory function than HRT non-users is discussed.

BIOLOGICAL MECHANISMS INVOLVING ESTROGEN

In recent years there has been an increasing interest in the role the central nervous system (CNS) plays in the control of menopause, and in turn, what effects the hormone estrogen may exert on the CNS during this time (Richards, Kuh, Hardy & Wadsworth, 1999). Estrogen appears to have an organisational and activational influence affecting the development and function of the CNS, and may also be responsible for the sexual differentiation of tissues in specific areas of the brain (Sherwin, 1998).

Animal studies have shown multiple sites of estrogen action, some of which play important roles in learning and memory function. These include the cerebral cortex, hypothalamus, amygdala, thalamus, the preoptic area, anterior pituitary, basal forebrain and the CA1 region of the hippocampus (Woolley & McEwen, 1993; McEwen, Alves, Bulloch & Weiland, 1997).

Estrogen is also known to influence several neurotransmitter systems, including acetycholine, noradrenaline, serotonin and dopamine (Henderson, 1997). Estrogen enhances cholinergic function that is known to be deficient in Alzheimer's disease by increasing the enzyme acetyltransferase in several areas of the brain, including the CA1 area of the hippocampus (Rice, Graves, McCurry & Larsen, 1997).

The neuronal atrophy that occurs in both the aging rat and human brain is expressed predominately in these cholinergic-rich regions of the CNS, including the basal forebrain, hippocampus and amygdala (Birge, 1996). Estrogen is thought to be responsible for stimulating neuronal repair, assisting in neuronal survival and function through neurotrophic growth factors (NGF) (Birge, 1996). For example, adult rats, at 28 weeks after ovariectomy, have been shown to perform poorly on tasks of memory and learning, as well as exhibiting a decline in cholinergic neuronal activity in both frontal cortex and hippocampal regions.

This deterioration appears to be prevented by the administration of estrogen replacement. It has been suggested that certain neuronal elements of the CNS (in particular those affected by memory loss disorders such as Alzheimers) are likely to be dependent on estrogen for their survival and function (Birge, 1996). The stimulation of neuronal regeneration and neurotropic growth factors evidenced by estrogen replacement has been shown to enhance learning (Birge, 1996).

Estrogen effects are also suggested in the mitigation of neurotoxic effects of stress-induced release of corticosteroids (Henderson, 1997). An increase in

Glucocorticoid Hormones appear to be able to damage hipppocampal neurc (Luine, 1994) and may be an additional mechanism through which estrogen influences hippocampal aging (Nappi et al., 1999). This has important implications in furthering our understanding of the effects of stress on memory performance.

Sherwin (1998), has rightly placed an important caveat on the assumption that changes in rats immediately apply to humans. The application of such findings requires replication or at least validation with human populations. With this caveat in mind, the findings from neuroscience described above clearly illustrate that estrogen, in addition to playing an important role in both the timing and organisation of menopause, may also exert a far wider effect on a variety of mechanisms including the preservation of cognitive function.

MENOPAUSE

The menopause is recognised as a universal event in women's life cycle. Menopause has been considered a process of many months or even years (Stevens-Long & Common, 1992), but is now more universally defined as the cessation of menses for longer than six months (Pearlstein, 1995). In the western world, menopause occurs at the average age of 50.8 years, and marks a period of transition for women as they move from a reproductive to a non-reproductive phase of the life cycle (Sherwin, 1994).

Menopause is thought to be a multifactorial process involving both neural and ovarian factors. At menopause, as well as age-related alterations in hypothalamic function, the ovarian follicle supply is finally exhausted leading to a decrease in the production of estrogen (Sherwin, 1994).

Prior to the approximate age of 40 years during the premenopausal phase, the ovaries are responsible for the secretion of 95 per cent of the estrogen that enters

the circulation (Sherwin, 1994). After this age, due to a continued diminishing number of oocytes, the ovaries produce decreasing amounts of estrogen, until finally there is insufficient hormone to sustain the monthly menstrual cycle. At this stage, the ovary no longer secretes estrogen and a dramatic decrease in plasma levels can be seen (Phillips & Sherwin, 1992). At this point, estrone, an estrogen that is a much weaker steroid, and that arises from a peripheral conversion from androstenedione becomes the predominant estrogen (Sherwin, 1994).

Certain physical symptoms are common during this period. These include hot flushes, night sweats and vaginal dryness. Complaints of memory problems together with an inability to concentrate are also among symptoms that have been associated with menopause (Phillips et al., 1992).

There is some evidence that suggests that menopause may be a fairly benign event for most women, and also that the transition can often represent an active reorganisation of life goals and attitudes (Slaven & Lee, 1998). However, from a biological perspective, there is increasing support for the implication of estrogen loss in being responsible for a wider decremental effect on the cognitive functioning of women in old age (McEwen et al., 1997).

HORMONE REPLACEMENT THERAPY (HRT)

The decline of the natural estrogens during the menopausal transition and the appearance of associated symptoms has led to the development and use of HRT to compensate for this decline. Prior to the onset of the menopause, three major types of natural female estrogens are produced. Estradiol is the more potent form, which is primarily produced during reproductive years. During menopause, estrone (a less active estrogen) becomes the more dominant estrogen and is produced by the conversion of androgens in adipose tissue. Estriol is the third and weakest of the natural estrogens (Coney, 1991).

The culmination of the increased knowledge about the decline in the amount of natural estrogens, and a greater awareness of the disruptive nature of symptoms, resulted in a medicalisation of menopause that introduced a theory of estrogen deficiency (Coney, 1991). As a result, efforts to limit both the menopausal symptoms, and an increased incidence of associated diseases, have contributed to the design of hormone replacement therapy (Coney, 1991; Mayeaux & Johnson, 1996).

There are three basic HRT regimens: Hormone Replacement Therapy (HRT) is defined as a combination of estrogen and progesterone therapy that is prescribed for women who show evidence of, and seek relief for, menopausal symptoms. This regimen can involve the estrogen and progesterone supplied simultaneously or sequentially (Coney, 1991). Estrogen replacement therapy (ERT) is a term used to describe estrogen therapy alone, or unopposed estrogen. This treatment is now generally reserved for those women who no longer have their uterus, as it has been strongly linked to endometrial hyperplasia and uterine cancer (Mayeaux et al., 1996). For the purpose of this thesis, the definition HRT will include both treatments unless indicated otherwise.

To date, the primary reason for the prescription of HRT for mid-aged women has been to alleviate a wide range of reported possible symptoms (Consensus Development Conference, 1993). The determination of which women are actually prescribed HRT depends to a large extent on the severity of the symptoms, the women's acceptance of their doctor's advice, and the amount of personal knowledge about HRT. The acknowledged risks of HRT use include endometrial and breast cancer and regular screening for these risks is recommended (Mayeaux et al., 1996).

HRT has been developed from estrogens that were first derived from pregnant mares' urine and this continues to be the major source. In addition to oral tablet form, administration of HRT can also occur by the application of transdermal

patches, subcutaneous implants and intravaginal creams, although the latter does not appear to have a major effect in menopausal symptom relief except in large or long-term doses (Mayeaux et al., 1996).

Following its development and inception, HRT has proved to be a valuable treatment in the reduction of long term disease (e.g., osteoporosis, cardiac events and mortality outcomes) (Newman, 1999). Together with the support of neuroscience and empirical studies, evidence has also emerged that suggests that HRT use may also be implicated in the maintenance and possible enhancement of memory (Sherwin, 1998), and as a protective factor against various types of dementias (e.g., Alzheimers, Vascular type) (Birge, 1997).

Although these recent findings may sharpen the focus of research, the inconsistency of much of the evidence serves notice that the issues of 'if' and 'how' HRT acts is at present unclear. These issues have become increasingly complex to investigate, with definite conclusions remaining elusive. However, the importance of such a determination can not be understated. If HRT use can and does exhibit enhancement and protective factors to older women, it is important to investigate the 'face validity' of such claims and demonstrate clearly what the practical outcomes of HRT use for menopausal women may be. This is essential in order to allow women a fully informed choice as to how HRT use may benefit particular individual women.

MEMORY AND MENOPAUSE

The relationship of cognitive and memory decline to changes that occur during the menopausal transition, has been largely based on the evidence of behavioural studies in animals. These studies have established a correlation of changes in neural architecture with hormone levels (McEwen et al., 1997). However, although there is also indirect evidence that estrogen has positive effects on cognitive

function in postmenopausal women (Sherwin, 1994), data on the effect of estrogen loss on cognitive performance in untreated women are few. It does not necessarily follow that the loss of ovarian function and the corresponding reduction in estrogen will result in a decline in memory function in all menopausal women. There is evidence that some women experience little or any decline at all in memory function (Birge, 1996). Furthermore, a recent study of both male and female mid-aged participants, failed to find any gender differences in the decline of cognitive function (Barrett-Connor & Kritz-Silverstein, 1999). This suggests that the estrogen deficiency associated with menopause may not be strongly associated with memory losses reported.

On the other hand, memory loss does appear to be a prominent complaint of postmenopausal women (Anderson, Hamburger, Liu, & Rebar, 1987). In support of the association of menopause and memory loss, a more recent study (Nappi et al., 1999) found that both surgical menopause and physiological menopause exerted a negative effect on short-term memory, whereas long-term memory, attention and psychomotor performances were largely unaffected. In addition, surgical menopause appeared to produce a more negative effect on short-term verbal memory than physiological menopause.

The EFFECT of HRT on MEMORY and COGNITIVE FUNCTIONING

In recent years there have been substantial reviews of research that has investigated the effect of HRT on women's cognition at menopause and in later life (Erkkola, 1996; Haskell, Richardson & Howitz, 1997; Rice et al., 1997; Sherwin, 1997; 1998; Yaffe, Sawaya, Lierberburg & Grady, 1998; Newman, 1999). While supporting the plausibility of the biological mechanisms that suggest an estrogen effect on memory, and noting the data that provides evidence of a positive relationship between the two (Rice et al., 1997; Yaffe et al., 1998), conclusions remain imprecise. Criticisms have included:

"Insufficiently investigated, poorly investigated" (Erkola et al., 1996, S30); "not sufficient evidence to recommend widespread use" (Haskell et al., 1997, p.1251; Newman, 1999, p.1268); "inadequate evidence, trials too inadequate to recommend for treatment of dementing disorders" (Yaffe et al., 1998, p.694); "evidence remains controversial with a need for more data and further elucidation of specific cognitive domains that may respond to estrogen" (Rice et al., 1997, p. 26S).

On the other hand, Sherwin (1998), suggests that despite the methodological problems that have impinged on the conclusions drawn, there is an "overwhelming finding that estrogen serves to maintain or enhance verbal memory whereas it has little effect on visual or spatial memory in women" (p.21). Of particular note and interest, is the fact that the women who received placebo treatment in these studies (Sherwin, 1988; 1990) did in fact complain more spontaneously of memory deficit, than those women who were using HRT.

Research investigating any possible effects of estrogen on memory and cognition in mid aged women has used both experimental and observational studies. Observational studies have in general focused on the association of estrogen with performance on cognitive and/or memory tests (Newman, 1999). These studies have mostly used cross sectional data and compared HRT current users with non HRT users. As a result, findings have been somewhat inconsistent.

After matching for age and education, Kampen & Sherwin (1994) found significant improvement only on one test, paragraph recall. Similarly, Robinson, Freidman, Marcus, Tinklenberg & Yesavage (1994), found significant improvement in HRT users for name recall, but not for word recall. Both of these studies involved post menopausal women and excluded those who were currently being treated for depression. Kimura (1995) employed 10 cognitive tests and a test of mood and subsequently described "overall" improvement. However, formal adjustment for

age and years of education was not undertaken and specific test results not reported.

More recently, Schmidt et al. (1996), used a cross-sectional design to determine any beneficial effect of estrogen on demanding cognitive tests, and to investigate if this benefit was due to the prevention of silent ischemic brain damage. A positive association was found between HRT and cognitive functioning and a lower rate of clinically unsuspected ischemic brain damage in post-menopausal women. Similar to previous studies, this study was limited by a relatively small sample size (70 participants using HRT), and may not have been truly representative of the entire population despite the use of random selection. The mean age of the women was 59 years and was somewhat younger than the previously mentioned studies.

In contrast to observational studies that have illustrated improvement only in paragraph recall and proper name recall, Schmidt et al. (1996) found evidence of improvement on tasks measuring complex problem solving and psychomotor speed as well as visuospatial and verbal memory. No evidence was found for group difference on mood. In a more recent cross-sectional observational study, Steffens et al. (1999), investigated the association between the history of estrogen use and cognitive function in a large sample of community-dwelling older women (65 years and older). However, no specific measures of memory were undertaken in this study. Cognitive assessment in this study consisted only of the administration of the modified Mini-Mental State Examination (3 MMSE), and did not allow identification of what specific aspects of cognition may have been influenced by estrogen. In addition, the scores for all user groups were all in the normal range which may indicate that a ceiling effect was reached (Newman, 1999). Although the effect of estrogen was reported as a positive one, the effect was quite small and it remains difficult to discern whether this effect was really due to estrogen use or some other design factor (Newman, 1999).

In a later, longitudinal study with a larger sample than most observational studies (727 participants), Jacobs et al. (1998), evaluated the relationship between a history of estrogen use and cognitive test performance. Measures of cognitive functioning here included standardised tests of memory, language, and abstract reasoning. Similar to other studies, HRT users were found to score higher at baseline, but in addition, scores on verbal memory improved over time. This study is important in that it suggests that estrogen benefits may extend to more global cognitive domains such as abstract reasoning and language as well.

In contrast to the positive findings of the above observational studies, there are others that have reported an apparent nil effect of estrogen on memory and cognitive function in women (Barrett-Connor & Kritz-Silverstein, 1993, 1999; Matthews, Cauley, Yaffe, & Zmuda, 1999). Two of these studies have utilised large samples and appear methodologically sound (Barrett-Connor et al., 1993; Matthews et al., 1999). Matthews et al. (1999), evaluated a cross-sectional and longitudinal association of HRT and cognitive function. Education, next to age was found to be the more powerful predictor of cognitive function than HRT use. Past and current estrogen users did not consistently perform better on cognitive tests. However, there were no specific tests of verbal memory, and because of drop out, longitudinal data only included the better functioning group. This study also demonstrated the possibility that a selection bias may be operating where education and HRT have been shown to be associated with higher cognitive function.

The Jacobs et al. (1998) and Barrett et al. (1993) studies are similar in that both employed large samples and standardised measures, although the tests used were different. It is possible that the contrasting results could reflect cohort differences. Barrett-Connor et al. (1993) reported data from a highly educated and exclusive sample, whereas Jacobs et al. (1998) was ethnically diverse, but of limited educational attainment.

In a more recent study, Barrett-Connor et al. (1999), used a cross-sectional study of men and women to examine gender differences specifically with memory. This study hypothesised that if estrogen deficiency is associated with memory loss in post-menopausal women, men should have less memory loss with age than women. However, similar patterns of decline were found with men after adjustments for age, depression and estrogen use. The authors conclude that the absence of sex differences in decline indicates a lack of association between estrogen deficiency and a decline in cognitive function. This finding is important as this is the first study that has attempted to determine whether there are sex differences in cognitive functions in age matched groups of elderly men and women.

The Barrett-Connor (1999) study supports the suggestion that the aging process itself may account for cognitive decline and so act independent of any hormonal effect (Sherwin, 1997). Further research is needed in the future to elucidate the individual contributions of the aging process and hormones and areas of possible interaction.

A consistent trend in the research has reported positive benefits of estrogen use, and furthermore suggest that the benefit may be specific to verbal memory (Sherwin, 1988; Sherwin et al., 1992). However, this finding may be due to a lack of specific measures of visuospatial memory, or insufficient power. A more recent cross-sectional, observational study found that women receiving HRT had fewer errors on a specific measure of short term visual memory, visual perception and constructional skills (Benton Visual Retention Test - BVRT) (Resnick, Metter & Zonderman, 1997). A longitudinal analysis in this same study also showed that HRT users maintained their performance over time, whereas non HRT users showed the typical age related increase in memory errors.

This finding has been further supported by a study that utilised positron emission tomography (PET), and neuropsychological assessments to examine brain

structure and function in individuals 55 years and older (Resnick, Maki, Golski, Kraut & Zonderman, 1998). HRT users showed better performance on neuropsychological tests of verbal and figural memory, and also showed significant differences in PET activation patterns during memory tasks. The findings of this study are not only credible from the point of their use of sophisticated imaging techniques, but also for the substantial battery of valid, reliable neuropsychological tests employed. Five cognitive domains were assessed: verbal knowledge, language, learning and memory, visuospatial abilities and perceptual speed. In addition, three items from the Rivermead Behavioural Memory Test were used to measure prospective memory. Unfortunately, data specific to this test were not reported. The major drawback of the study is that it is observational, and again, as in previous studies, differences may reflect baseline differences in the characteristics of women who choose to receive HRT.

Randomised, controlled trials have also provided empirical data to analyse the effects of HRT on cognition and serve to control issues of bias and confound (Rice et al., 1997). On the whole, experimental studies have found a positive relationship between estrogen use and cognition and more specifically verbal memory in both post surgical and natural menopausal women (Sherwin et al., 1988, 1990, 1992; Fedor-Freybergh, 1977; Wolf et al., 1999).

However, as with the observational studies, there are studies of equal merit that provide contradictory data (Ditkoff, Crary, Cristo, & Lobo, 1991; Vanhulle & Demo, 1976; Polo-Kantola, Portin, Helenius, Irjala & Erkkola, 1998). In both the observational and experimental studies, methodological problems are recognised as being responsible for the inconsistencies (Sherwin, 1992). Sample sizes have typically been small. In addition, samples are often obtained from other surveys (e.g., Barrett-Connor et al., 1993) and may include the confounding effects of underlying disease or medications that may counter any positive effect of estrogen (Polo-Kantola et al., 1998).

As mentioned above, various types of tests that measure different aspects of cognitive functioning have been employed which make comparisons of results difficult. Validity and reliability of these tests is not always available (Sherwin, 1998). Also tests may tap specific functions of memory that are not affected by estrogen levels (Sherwin, 1998).

A further methodological difficulty that has been evident in previous studies is that different types and differing doses of estrogen preparations have been used, and circulating hormones not always measured (Sherwin, 1997). The path to a more definitive explanation for how HRT may act to preserve memory function has not always been clear. This is due in large part to the different regimens of HRT prescribed, and the differing effects these may have on individual women (Sherwin, 1998). Recently, the particular dose, type and route of administration of estrogen preparations has been under scrutiny (Steffens et al., 1999). It is thought that these differences may alter the impact that estrogen may have on memory functioning. This degree of impact is likely due to a differential absorption and metabolisation by the liver, as well as the degree of diffusion of the different estrogens into the brain (Sherwin, 1997).

A dose response relationship of estradiol to memory enhancement has been observed in plasma levels. There is also evidence that the brain remains sensitive to estrogens after a considerable period of low plasma estradiol concentrations (Wolf, Kudielka, Hellhammer, Torber, McEwen & Kirschbaum 1999). However, in contrast, Steffens et al. (1999) found no evidence of a dose-response relationship when measuring Mini-Mental Status Exam Scores (3MMSE).

Despite the sharpened focus that the measuring of estrogen levels bring to the investigation of an HRT effect on cognition, the findings remain inconsistent. Also, the demonstrated effect of estrogen on verbal memory to date appears to be modest. Although the small degree of 'better performance' on a number of demanding neuropsychological tests may indicate a positive effect of estrogen, the

clinical relevance of these findings has yet to be addressed (Sherwin, 1998). Replicated data does not necessarily mean that untreated surgically menopausal women may be clinically impaired in a way that might affect their daily functioning in the real world (Sherwin, 1998).

Despite this conundrum, menopausal and post-menopausal women do spontaneously complain of memory deficits and to date, research has not examined what impact HRT use may have those on aspects of memory utilised in the performance of everyday tasks. Furthermore, the ecological validity of the types of tests used to assess the effect of HRT on memory performance has not been established. As a consequence, there remains a need to examine the relationship between HRT use and memory ability in everyday functioning.

SUMMARY

There is now accumulated evidence from neuroscience that provides an empirical basis for the view that estrogen exerts effects in areas of the CNS that are known to be involved with the production of memory and learning (Birge, 1997). Estrogen mechanisms also appear to be involved in the mediation of NGF and neurotransmitters that are known to be associated with memory pathology. In addition, animal studies have shown that lowered levels of circulating estrogen do contribute to neuronal loss and also, that these changes can be reversed by the administration of estrogen (Luine, 1994; McEwen et al., 1997). This finding further contributes to the evidence that estrogen loss may affect memory. However, the generalisation of these observed changes in rats to the possibility of similar changes occurring in humans needs to be made with care (Sherwin, 1998). Menopause in human beings is recognised as a universal event, a process that involves neural and ovarian factors and is associated with a corresponding decrease in estrogen. Currently, HRT is prescribed to compensate for this loss of estrogen and to assist in the alleviation of symptoms. Although estrogen loss at

menopause is well documented and circulating estrogen levels have been shown to be associated with memory function (Wolf et al., 1999), studies that have investigated the effect of HRT on memory continue to produce contradictory and in some part, unconvincing evidence. This is possibly due to methodological problems including different measures of memory, small samples and a bias in the self selected nature of the sample. Modest evidence for a positive association of HRT use with verbal memory and more recently, visual and more complex cognitive functioning has been shown. As yet though, there is not enough evidence to recommend HRT for enhancement of memory in older women. In addition, the clinical relevance of such evidence is unclear. This lack of clarity is due in part to a lack of ecological validity in the research to date.

CHAPTER 3

MEMORY AND ITS MEASUREMENT

MEMORY

Memory is just one component of an individual's cognitive abilities which arise from a complex central nervous system (Sherwin, 1998). Memory itself, is also not a unitary system, but composed of processes involved in the registration, storage and retrieval of information acquired through the senses (Lezak, 1995).

Everyday Memory has been defined as:

> "memory that is involved in the performance of everyday life tasks and measured either outside of the laboratory, or using simulated everyday life tasks, inside the laboratory " (Tomer, Larrabee & Crook, 1994, p.606).

The term 'everyday memory' originated from an address by Neisser (1978) that sharply criticised the sterility of memory research undertaken in the laboratory, arguing that it failed to capture, or to represent memory as it occurred in the real world. A spirited discussion concerning issues of generalisability and theoretical worth followed this address (Banjai & Crowder, 1989; Ceci & Bronfenner, 1991).

What has emerged out of an ongoing debate since that address, is a wide acceptance that it is possible, and helpful to study memory outside the laboratory. However, there is acknowledgement that issues of control (e.g., material to be remembered, circumstances of presentation and participant's motivation), as well as issues of reliability and validity remain problematic (Gathercole & Collins, 1992; de Wall, Wilson & Baddeley, 1994). With the development of the 'everyday' approach, the study of memory has incorporated memory events that more closely correspond to the 'everyday' memory tasks and can be considered more ecologically valid.

Methods used to assess everyday memory have included natural observations, simulations of work activities and self-report questionnaires (Pollina, Greene, Tunick & Puckett, 1992). More recently, attempts to study everyday memory have developed an approach that resembles a bridge between laboratory assessment and assessment obtained by questionnaire and observation (e.g., The Rivermead Behavioural Memory Test; Wilson, Cockburn, Baddeley & Hiorns, 1989).

Aside from the controversy mentioned above, the concept of everyday memory at present seems to embrace and reflect specific aspects of memory (de Wall, Wilson & Baddeley, 1994) that have been established in the laboratory. Those aspects of memory that have been identified as being implicated in the impaired performance or failure of everyday tasks include short-term memory (immediate or delayed recall), visual and non verbal memory, recall and recognition memory, and prospective memory. How these aspects of memory are measured (i.e., the tasks employed), and the factors that are known to affect the memory are now described.

CONSTRUCTS OF MEMORY

Short-term memory (STM) deals with memory that has just been presented and is still in the individual's conscious awareness. STM tasks that involve holding the material passively have been defined as primary memory, whereas the manipulation of information while being held is referred to as working memory (Craik, Anderson, Kerr & Li, 1995). STM decays in milliseconds, is attention dependent and can be stored from approximately 30 seconds to one hour (Lezak, 1995). The capacity of STM is recognised as equivalent to the number of items that a person can hold in mind at the same time. This is usually measured by a "span", such as the longest number of digits or words that can be reproduced accurately.

Working memory has been described as a system that allows the temporary holding and manipulation of information while other cognitive tasks are performed

(Baddeley, 1997). Theoretical components of working memory are thought to be responsible for the strategies that are employed to manage incoming information, and for the maintenance and alteration of attention (Baddeley, 1997). Selective, sustained and divided attention are thought to be mediated by working memory and it appears difficulties in these aspects of attention have been identified as early occurrences in Alzheimer's-type dementia (Glass, 1999).

In addition to the distinction of STM, there are memories that appear to be specific to the nature of the information to be learned (e.g., verbal and non-verbal information) (Lezak, 1995). Verbal memory tasks utilise tasks that measure the length of digit span (i.e., the immediate recall of numbers), word list recall, and story recall (immediate and delayed) (Lezak, 1995).

Long-term memory (LTM) refers to the ability to store information and involves tasks that require memory for material that has left conscious awareness from anything from seconds to years ago (Lezak, 1995; Craik & Jennings, 1992). As described above, LTM is therefore defined as by default (i.e., anything that is not currently in consciousness), and is made apparent by the ability to recall information after a delayed interval (Glass, 1999). However, it may not always be possible to clearly establish whether information presented 20 minutes earlier and subjected to a delayed recall is actually from LTM (Groeger, 1997). Theories have also established distinctive components of LTM, including episodic (involving the encoding and retrieval of specific autobiographical events); semantic (context independent) and more recently implicit (memory requiring the performance of a task) and explicit memory (memory for information is required) (Craik et al., 1995).

Non-verbal or Visual Memory can be defined as memory for pictures, faces and spatial information (Craik et al., 1995). Visual memory tasks include face, picture, line drawing or object recognition and recall (Lezak, 1995). Another type of non-verbal information is the recall of personal behaviours that may be performed on an everyday basis. Tasks include performing a sequence of activities such as

retracing a route around a room and observing retention levels (Hess & Pullen, 1996; Wilson et al., 1999). Furthermore, non verbal spatial information that allows the navigation around, and the location of objects in an individual's environment, is assessed by tasks that test location recall of objects that are visually presented on display. Familiarity and the use of effective strategies appear to affect the performance of these tasks (Hess et al., 1996).

The effectiveness of memory is dependent on retrieval which involves both recognition and recall aspects (Lezak, 1995). Recognition memory occurs when a similar stimulus triggers awareness. Assessment involves either the individual making a decision about a previous occurrence, or distinguishing between items previously encountered (Lezak, 1995). Most studies assess accuracy in a way that takes into account both accurate and inaccurate (i.e., false negatives; Hess et al., 1996). Tasks include recognition of faces, pictures or words such as the Warrington Recognition Memory Test (1984)(Lezak, 1995) and can be cued or uncued. Faces are often paired with a name which is later used as a cue for recall.

In contrast, recall memory occurs when information is retrieved as a result of an active complex search process (e.g., "Who is the President of the USA?"; Lezak, 1995). Recall involves 'free memory' and is assessed by using only a general cue (Banich, 1997). However, assessment of recall can also involve the use of direct cues, for example, "One of the photos had something to do with cooking - Can you remember what it depicted?" Recall memory is generally thought to be more difficult than recognition memory and involve more effortful processing (Craik & McDowd, 1987).

Apart from aging, factors that affect recall and recognition appear to be the strength of the cue, familiarity, and context (Hess et al., 1996). In addition, although the evidence is not clear, depression has been associated with deficits in both recall and recognition (Baddeley, 1990).

Prospective Memory is defined as the ability to remember to perform activities in the future (e.g., remembering to keep an appointment or to give someone a message) and is in contrast to retrospective memory which is memory for past events (remembering someone's name) (Einstein & McDaniel, 1990). Data collected from both naturalistic and laboratory settings (Cherry & LeCompte, 1999) have identified a number of factors that affect impairment in prospective memory tasks. Data from both settings have also highlighted specific age-related paradox and difficulties with the research of this memory task (Rendell & Thomson, 1999).

Typical procedures for testing prospective memory have involved asking subjects to perform some action in naturalistic settings at specified times in the future (e.g., telephone the researcher, or send a postcard) (Einstein et al., 1990). The use of naturalistic experiments raised concern about the loss of control of a number of varying factors (e.g., memory strategies employed by participants, compliance, motivation). Laboratory tasks have also been criticised as not allowing for any contextual integration by the participant (Einstein, McDaniel, Richardson, Guynn & Confer, 1995). In a laboratory task, participants may be presented with lists of words for learning after being instructed to perform an action whenever a particular target word appeared (Einstein, Holland, McDaniel & Guynn, 1992). It has been suggested that the findings from laboratory studies may not transfer to the real world, due to the high degree of sensitivity to the methodology used (Cohen, 1996).

There is evidence that there may be two types of prospective memory tasks. One of these has been described as event-based, where prospective memory is spontaneously cued by the occurrence of a specific external event. A second, time-based memory occurs as a result of a cue following the passage of time (Einstein et al., 1995). Any observance of effects on prospective memory is thought to depend on the type of prospective task (Cherry et al., 1999). Aside from age-related decline in prospective memory (discussed below), ability (i.e., years of education), working memory span and recognition have been shown to account for

small, but significant proportions of variance in prospective memory (Cherry et al., 1999).

MEASURES OF MEMORY

Neuropsychological tests allow for the impairment in distinctive components of memory to be identified (Lezak, 1995). One noticeable result of these attempts to measure the performance of separate memory functions has been the proliferation of testing instruments (Lezak, 1995). A further sequel to such proliferation, is the current lack of systematic comparisons between many of these different tests. This means that their interchangeability and relative usefulness is questionable (Lezak, 1995). This is particularly applicable in studies that to date, have attempted to measure the effect of HRT on memory in post-menopausal women. Numerous and very different neuropsychological tests have been employed throughout the period of study, and this variety of measures may have contributed to the confused and inconsistent findings (Sherwin, 1998).

Aging, environmental influence and psychosocial variables interact in important ways to affect cognitive decline (Moscovitch & Wincour, 1992). With particular regard to the literature that has assessed the effect of HRT on memory, not all studies have measured or controlled for the numerous variables that may impact on memory performance (Sherwin, 1998).

There has also been inconsistency in the approach to measuring memory. Although most studies have employed reliable and valid measures of cognitive functioning, not all studies have included comprehensive memory assessment (Sherwin, 1998).

Furthermore, even some of the more comprehensive memory measures that have been utilised in the research and that are widely accepted and employed, offer several issues of concern. For example, the Wechsler Memory Scale-Revised

(WMS-R) and the Luria Nebraska Neuropsychological Battery Memory Scale (LNNB-M), have been criticised for lacking ecological validity (Makatura, Chows, Leahy, Castillo & Kalpakjian, 1999).

Almost all of the studies that have investigated the possible effects of HRT in women have used these, or similar measures (Barrett-Connor et al., 1993, 1999; Schmitt et al., 1996; Henderson, Watt & Buckwalter, 1996). More recently, a new approach that utilises computerised methods that can examine the speed of information processing has been developed (Polo-Kantola et al., 1998). However, again, the issue of ecological validity emerges. The age-related losses revealed by these tests may also fail to accurately reflect the degree of interference in everyday tasks in the real world (Rybash, Hoyer & Roodin, 1986). In the past, empirical data supporting a correlation between test performance on these earlier measures and performance in everyday functioning has been limited (Wilson, 1993). As a result, a fueled debate as to whether the findings that result from such testing are of any significance has arisen. Little or any functional representation may actually occur, as any compensations that individuals may make in everyday memory tasks are not always accounted for by these assessment measures (Rybash et al., 1986).

Everyday Memory has been described earlier as "memory that is evidenced in everyday life tasks..." (Tomer et al., 1994, p.606). Makatura et al. (1999) argue that the psychometric instruments mentioned above tend to focus on how memory works rather than what an individual can do with the capacity. As a result, these types of instruments may fail in the assessment of areas that are often critical to everyday functioning. A compelling argument exists to suggest that the testing of memory in ways that simulate realistic everyday tasks, may provide more accurate information.

Over the past few decades, there has been a rising concern regarding the lack of measures available for the assessment of the function of memory under realistic conditions. The result of such concern has seen the development of standardised

measures that present more emphasis on ecological relevance (Wilson, Cockburn & Baddeley, 1985; de Wall et al., 1994). One of these, the Rivermead Behavioural Memory Test (RBMT) (Wilson et al., 1985), has been shown to be superior to the WMS-R in assessing everyday functioning when compared with behavioural observations (Makatura et al., 1999). An extended version of the RBMT, the RBMT-E (Wilson et al., 1999) has recently been developed in order to enhance the original test's sensitivity in the detection of mild deficits. This extended version allows the opportunity to assess the everyday memory problems from a 'normal' and much younger sample and so will establish a starting point for future longitudinal studies. It is predicted to be a promising and ecologically valid measure of everyday memory in normal adults (de Wall et al., 1994).

MENOPAUSE and MEMORY - RELATED VARIABLES

Aging

Cognitive difficulties observed in mid aged women may be accounted for by an aging process that may operate independent of estrogen effect (Sherwin, 1998). Memory loss, particularly the encoding and retrieval of new information is a common concomitant of aging (Barrett-Connor et al., 1999), although impairment in memory function can occur as a result of brain pathology and emotional disturbances as well as the aging process (Lezak, 1995).

Longitudinal results report modest, gradual cognitive decline with aging, with an inflection point of around 60 years of age (Youngjohn & Crook, 1993). Age related deficits appear to develop in specific areas of memory (Lezak, 1995; Sherwin, 1997). These include short-term memory (with the increased difficulty in encoding and retrieval of information), memory for activities, recognition, free/cued recall, visual/non verbal memory, and prospective memory (Smith & Earles, 1996). In general, older adults also demonstrate poorer performance on recall, recognition, memory for short paragraphs, while memory for remote past events remains intact (Lezak, 1995). Age differences also appear to be larger in tasks that are more

difficult and that involve more deliberate or effortful processing, while in contrast age differences do not appear on semantic memory tasks (Smith et al., 1996).

Working memory also shows evidence of an age-related decrease in speed and accuracy. The differences appear to be directly related to the processing efficiency which is facilitated by the speed with which operations can be successfully executed (Smith et al., 1996). In general, the measure of digit span declines only slightly with age, whereas word span shows a greater age decrement (Craik et al., 1995). However, when memorisation includes an amount longer than immediate storage capacity (e.g., as in story recall), aging decrements are observable with larger decrements found in a delayed recall test as age increases (Lezak, 1995).

Age differences occur in the ability to learn a new route (e.g., non-verbal, visuospatial memory), with older participants demonstrating a poorer performance. It does not appear that the context or the distinctiveness of materials used in the testing procedure impacts on the extent of the age differences observed, although the age effects have been found to be smaller when meaningful or familiar contexts are used (Hess et al., 1996).

Recognition Memory performance shows age-related impairments that may be due to a failure to encode, however, the age decrements are smaller than test of recall (Craik et al., 1987; Hess et al., 1996). Cross sectional studies have demonstrated these decrements as a gradual decline from as early 50 years of age. The poor performance appears to be related to the higher rates of false positives which may be due to encoding strategies (Hess et al., 1996). Age differences in the recognition of photographed scenes are typically slight, but age related deficits are found when free recall or cued recall is the measure (Craik et al., 1995).

Prospective memory studies have highlighted paradoxical age-related differences between naturalistic and laboratory tasks, with the latter producing an age-related decline, while naturalistic prospective memory tasks failed to show age differences

(Rendell et al., 1999). A likely explanation for this paradox is thought to arise from differences in the nature of the everyday tasks that are utilised by the different methods (Rendell et al., 1999).

Prospective memory that has been shown to decline with age, appears to occur especially in situations where the environment may offer few clues as reminders (Craik et al., 1992). In addition, age decrements have been found on time-based tasks, although age differences appear to be minimal on simple prospective memory tasks (Einstein et al., 1992). This is thought to be due to the degree of self-initiation required which may be susceptible to aging effects (Einstein et al., 1995).

More recently, there also appears to be a robust age-related decline in event-based prospective memory tasks, especially when the tasks are sufficiently demanding, as occurs when the number of cues are increased (West & Craik, 1999). In the past, it has been suggested that these more complex prospective tasks are especially difficult for older participants, because of an increase in the difficulty of the retrospective memory component that exists within the prospective memory task (Einstein et al., 1992).

Failures in prospective memory have also recently been linked to an age-related decline in cue accessibility (i.e., the amount of processing required to activate the prospective cue-action schema). The decline in cue accessibility may reflect a reduced ability of adults to maintain an integrated representation of the context (West et al., 1999). Altogether, the extent to which age differences emerge in prospective memory tasks depends on the type and complexity of the prospective memory task and the accessibility of cues (West et al., 1999).

Everyday memory as a concept, has been considered to be relatively stable throughout adulthood until the later decades of life (Youngjohn et al., 1993). Furthermore, age-related decline has not been evidenced in activities that are

dependent on everyday experiences (Poon et al., 1992). However not all studies have utilised a formal measure of everyday memory (Glass, 1999).

Other possible confounding variables such as age, education, health, sleep, stress and mood are also likely to be involved in the possible effect of the menopause process on memory. It is likely that biological aging, environmental influence, psychosocial variables all interact in important ways to affect cognitive decline (Moscovitch et al., 1992). Furthermore, chronological age has previously been found to be the least influential factor in accounting for total variance in memory performance (Arbuckle, Gold & Andres, 1986 cited in Moscovitch et al., 1992). Studies have shown that medical history, educational level and lifestyle can contribute to significant differences in cognitive abilities among individuals within the same age range (Moscovitch et al., 1992).

However, in contrast, other studies have not provided any evidence that health factors or education account for age differences in memory (Salthouse, Kausler & Saults, 1990; Earles, Brannon & Hill, 1993). A possible explanation for the disparate findings with education is the changes that have occurred in the quality of education offered to different cohorts (Smith et al., 1996).

Sleep

Sleep difficulties have been associated with menopause in that higher levels of difficulty are reported at later stages of the menopause transition (Slaven et al., 1998). Concentration and memory lapses have been associated with sleep deprivation, although performance has generally been found to be better than anticipated (Weiten, 1995). However, increased interruptions in sleep have been shown to be associated with increased disruptions of mood and a reported decrease in general wellbeing (Peterson & Schmidt, 1999). However, it has not been clearly established whether some of the psychological symptoms that occur during menopause (e.g., mood disruption and less satisfaction in daily tasks) are

due to lowered estrogen and progesterone levels, or are a function of disrupted sleep (Peterson et al., 1999).

Stress

Stress is an acknowledged factor in the disruption of attention that also leads to impairment in a variety of functions including cognitive functioning (Weiten, 1995). Women enter the menopause transition at an age where it is highly likely that they have experienced or are currently experiencing divorce, death of spouse or parent, loss of employment, children leaving home and other major life events (McKinlay, McKinlay & Brambilla, 1987). There is now evidence from longitudinal studies that appears to add some weight to the hypothesis that these changes in life events may be associated with the observable psychological distresses noted during menopause (Slaven et al., 1998).

Mood

Emotional lability, depression and a decreased sense of well-being are common complaints during the menopausal transition (Mayeaux et al., 1996). Controversy exists as to whether these observed changes in mood constitute a menopause-related mood disorder, and there does not appear to be clear evidence of any increase in depression that is related to the menopausal years (Ballinger, 1990). However, there is the suggestion that women with known histories of depressive symptoms may be at increased risk during menopause which may indicate an increased risk for this group of women (Pearlstein, 1995).

Alteration in mood has been associated with the reduction of estrogen that occurs at menopause. Two neurotransmitters (serotonin and norepinephrine) are involved in the regulation of mood, and biochemical evidence now suggests that estrogen effects may influence this regulation of mood (Halbreich, 1997).

The idea that a reduction in estrogen may predispose post-menopausal women to depression remains controversial and has not always been supported by epidemiological studies (Halbreich, 1997). In addition, empirical data has not always supported estrogen as an effective treatment for major depression, although interestingly, it has been reported to have a positive effect on healthy, non depressed, post-menopausal women (Ditkoff et al., 1991).

However, HRT does appear to play a role in the amelioration of some depressive symptoms. Chatel, Fugere, Bossinette & Berube (1996) found depression scores improved, although not significantly, in a group of 57 women attending a menopause clinic. Also, Cagnacci, et al. (1997) found that estrogen use improved depression and anxiety as measured by the Self -Evaluation Depression Scale, although a later study failed to demonstrate any beneficial effect of HRT on depressed mood (Cagnacci, Neri, Tarabusi, Volpe & Facchinetti, 1999).

Between these two reported studies, and contributing to a continuing controversy, a meta-analysis of the effect of HRT on depressed mood (Zweifel & O'Brien, 1997) concluded that HRT was effective in reducing depressed mood in menopausal women. In this meta-analysis, methodology, such as controlled design, sample sizes and valid measures of depression were all reported as adequate. A later, more limited review (Archer, 1999) further supports this stance, concluding that there is suggestive evidence that estrogen may be an effective treatment for depression in both perimenopausal and menopausal women.

It is possible that the variable definitions of depression and menopause contribute to the disparity of the findings, making interpretation problematic. In addition, sample characteristics, such as women presenting at menopausal clinics being a self-selected population and the likelihood of these women having experienced previous depressive episodes, may further compound interpretation difficulties (Pearlstein, 1995). Thus, research samples may not always be representative of the menopausal population of women. However, on the whole, there is increasing

empirical support for a positive effect of HRT on mild to moderate depressive symptoms that may accompany the menopause transition.

A link between depression and cognitive abilities such as memory has been acknowledged, although significant memory impairments have not always been associated with depression, and research is often contradictory (Lezak, 1995). For example, no differences have been found between depressed unmedicated women and matched controls (Gas & Russell, 1986). Also, although non depressed participants have demonstrated a trend towards higher scores, significant differences in tests of verbal short term retention or learning have not been found (Marsh, Marsh & Johnson, 1987, cited in Lezak, 1995). In addition, depressed patients have been shown to perform as well as non-depressed patients in tests of speed, recognition memory and abstraction (Cole & Zarit, 1984).

However, depressed patients have been shown to demonstrate cognitive impairment and forgetfulness. Impaired performance on attention and immediate memory tasks has also been shown, with the severity of impairment related to the depression (Cohen, Weingarter, Smallberg, Pickar & Murphy, 1982). Facial recognition has been found to be significantly impaired relative to test norms, although verbal learning and memory measures remained at normative values (Sweeney, Wetzler, Stokes & Kocsis, 1989). Difficulties in concentrating, and changes in cognition such as problems in thinking and making decisions, are listed as symptoms of depression in the DSM IV (Kaplan & Sadock, 1998).

It is thought that the memory dysfunction demonstrated in association with, or as a result of depression is more likely to be a reflection of poor encoding than a learning problem. Deficits demonstrated in both verbal and visuospatial material have been attributed to retrieval on free recall, rather than learning (Massman, Delius, Butters, Dupont & Gillian, 1992).

The above review highlights the complexity of the relationship between mood (in particular depression) and cognitive ability. The association of menopause with

mood lability is well documented, and clinically observed, but remains controversial (Halbriech, 1997; Mayeaux et al., 1996). Much of the literature, but not all, supports the presence of significant and specific impairments in cognitive ability in clinically depressed individuals (Lezak, 1995). HRT use has been shown to improve mild to moderate depressive symptoms (Cagnacci et al., 1997; Archer, 1999). In view of the evidence of such an association between mood and cognitive ability, research that investigates the effects of other variables on memory must consider and control for the possible confounding effects of mood.

SUMMARY

The association between the construct of memory and the processes of aging and menopause is a complex one. The period of menopause has been linked to memory deficits, with women undergoing surgical menopause in particular, showing a negative affect on short-term verbal memory. Generally, the measurement of memory has often lacked both external and ecological validity (i.e., the degree to which tasks used in research are similar to the tasks of everyday life) (Hess et al., 1996). The presence of a number of confounding variables has increased the difficulty in assigning clear and independent associations of the effect of these variables in previous studies. In particular, the accurate assessment of affect or mood state is important when assessing the memory of mid-life women. Somatic symptoms, such as fatigue, insomnia and changes in weight, that occur during the menopausal transition are frequently used to index depressive or anxious feelings. Thus far, there has been a surprising lack of research investigating the possible effect of HRT on older women's cognitive functioning, particularly in regard to the performance of everyday tasks. Such tasks include the ability to remember names, to recognise faces, to recall where personal belongings have been left, to attend to and remember conversations, and to remember to remember. The ability to perform these tasks are all important aspects of everyday memory functioning. Ultimately, the preservation of these abilities determine the quality, and independence of living maintained by women as

they continue through, and past the menopause transition. This is of increasing relevance as society prepares for an increased aging population and the projected associated increase in dementia, especially of Alzheimer's type. Investigation of the possible relationship between HRT use and everyday memory tasks is one of the aims of the present study.

CHAPTER 4

PURPOSE AND FORMULATION

This present study was undertaken to assess the relationship between HRT use and mid-aged women's cognitive status. The study was planned in order to establish the suitability and cultural sensitivity of measures that to date, had primarily been used with overseas populations. In particular, the study would pilot the use of The Rivermead Behavioural Memory-Extended Test (a newly created measure of everyday memory tasks) on a New Zealand sample of mid-aged women. The data would also provide some estimates of the relationships between mood, HRT use and memory in a sample of mid-aged New Zealand women.

AIMS OF THE PRESENT STUDY

- The first aim of the study is to investigate the effect of HRT use on the everyday memory ability of New Zealand women between the ages of 40 and 60 years. More specifically, to test whether there is a significant difference in everyday memory performance between mid-aged women using HRT and women not using HRT, while taking into account the effects of age, mood, education, general health and stress.

- A second aim of the study is to evaluate the use of a measure of everyday memory (The Rivermead Behavioural Memory Test-Extended Version) on a sample of mid-aged women.

HYPOTHESES

- The first hypothesis is that women who use HRT will show better everyday memory ability than those women who do not use HRT, while controlling for

age, affect, mood, health, education and stress. In addition, it is expected that verbal memory will show the greatest difference between the two groups.

- The second hypothesis predicts that memory ability will decline with increasing age.

- The third hypothesis predicts that age will moderate the relationship between HRT use and memory ability. More specifically, it is predicted that differences in memory ability between HRT users and non HRT users will be greatest for older women.

- The fourth hypothesis predicts that mood will be positively related memory ability. More specifically, positive mood will be associated with better memory and conversely, negative mood will be associated with poorer memory ability.

- The fifth hypothesis predicts that mood will moderate the relationship between HRT use and memory ability.

DESIGN

The study employed a cross-sectional, correlational, between subjects design, comparing a sample of New Zealand women aged between the ages of 40 and 60 years who were either HRT users or non HRT users.

CHAPTER 5

METHOD

PARTICIPANTS

A total of 104 women with an age range of 40-60 years (mean age, 51.67 years) who volunteered to participate in the project were studied. Of these women, 53 (51%) were HRT users and 51 (49%) were non-users. Demographic data for the total sample are summarised in Table 1. To avoid duplication and for ease of comparison, data for the two HRT use groups are included. Twenty-six percent considered themselves pre menopausal, 39.4% as menopausal, and 33.7% identified themselves as post-menopausal. All the women were functioning independently in the community and 76.9 % were employed in a full or part -time work. Seventy per cent reported participating in regular exercise, while 63.5% of participants were taking some form of prescribed or 'over the counter' medication. Fifty-five percent of the sample had received an excess of 12 years education, and of this group, 60% were being treated with HRT.

Participants were recruited by a number of methods including speaking to health professionals (Gerontologists) at a local hospital in Christchurch, and by advertisements (see Appendix 1) placed in local newspapers in Christchurch and Palmerston North. The following inclusion criteria were used:

1. Women aged between 40 and 60 years of age
2. All ethnic groups of New Zealand citizens.

Table 1.
Demographic & Health Characteristics of HRT use Groups and Total Sample.

	HRT use (n=53)		non HRT use (n=51)		Total (n=104)
Age	52.34 years (Mean)		50.98 years (Mean)		51.67 years (Mean)
Ethnicity					
NZ European	48	(51.6%)	46	(48.4%)	90.4%
Other Ethnicity	5	(9.4%)	5	(9.8%)	9.6 %
Education					
High School (<11yrs)	20	(37.7%)	26	(51.1%)	44.2%
Diploma/Tertiary (> 12yrs)	33	(62.3%)	25	(49.0%)	55.8%
Employment					
full/part-time paid	43	(81.1%)	37	(72.5%)	76.9%
full-time unpaid	10	(18.9%)	14	(25.4%)	23.1%
Exercise	36	(67.9%)	36	(70.6%)	69.2%
Nil exercise	17	(32.1%)	15	(29.4%)	30.8%
History:					
Head Injury (yes)	10	(18.9%)	9	(17.6%)	18.3%
(no)	43	(81.1%)	42	82.4%)	81.7%
Smoking					
Never	27	(50.9%)	36	(70.6%)	60.6%
Past	21	(39.6%)	12	(23.5%)	31.7%
Present	5	(9.4%)	3	(5.9%)	7.7%
Family neurological					
Strokes	14	(26.4%)	12	(23.5%)	25.0%
Alzheimer's dementia	5	(9.4%)	6	(11.8%)	10.6%
Other dementia	3	(5.6%)	2	(3.7%)	4.8%
Neurological	31	(58.5%)	32	(62.7%)	60.6%

An IQ mean (122, SD. 6.35) was established for the total sample from the scores on the NART, a measure of crystallised intelligence. The NART scores yielded a mean of 6.51 (SD. 5.11) errors for the total sample. Ninety-six percent of the entire sample were classified as above average (predicted IQ 111 and above), and 3.2% as average group were classified as average (predicted IQ 90-110). The high percentage that is classified as above average may not be representative of the population of mid-aged women. Table 2 shows the means and standard deviations of the NART and IQ for the total sample.

Table 2.
NART Errors and established IQ classification for Sample.

	Mean (SD) (n=104)	
NART errors	6.51	(5.11)
IQ	122	(6.35)

The histories of personal illness for the sample are shown in Table 3. The numbers of women who used concomitant medication are shown in Table 4. Both tables are expressed as a percentage of either the HRT or non HRT group as well as for the total sample.

Table 3.
Personal Medical History of HRT use Groups and Total Sample.

Personal Illness	HRT users (n=53)		non HRT users (n=51)		Total (n=104)	
Diabetes	2	(3.7%)			2	(1.9%)
High BP	11	(20.7%)	12	(23.5%)	23	(22.11%)
Heart Disease	1	(1.9%)	2	(3.9%)	3	(2.88%)
Epilepsy			1	(2%)	1	(0.96%)
Cancer	4	(7.5%)	5	(9.8%)	9	(8.65%)
Depression (history)	16	(30.2%)	5	(9.8%)	21	(20.19%)
PMT/symptoms	21	(39.6%)	22	(43.1%)	43	(41.34%)

Table 4.
Concomitant Medications Use by HRT use Groups and Total Sample.

	HRT use (n=53)	non HRT use (n=51)	Total (n=104)
Asthma	4 (7%)	2 (3.9%)	6 (5.76%)
Anti-inflammatory	5 (1%)	4 (7.8%)	9 (8.65%)
Memory enhancing		6 (11.7%)	6 (5.76%)
Antidepressants	4 (7%)	3 (5.8%)	7 (6.73%)
Vitamins/Minerals	12 (22.6%)	13 (25.5%)	25 (24.03%
Calcium	10 (18.8%)	5 (9.8%)	15 (14.42%)
BP medication	11 (20.7%)	8 (15.6%)	19 (18.26%)
Thyroid	4 (7.5%)	4 (7.8%)	8 (7.69%)
Peptic ulcer	2 (3.7%)	1 (1.9%)	3 (2.88%)
Sleep	2 (3.7%)	1 (1.9%)	3 (2.88%)
Pain	1 (1.8%)		1 (0.96%)
St. John Wort		1 (1.9%)	1 (0.96%)

MEASURES

The following scales (see Appendix 2), were chosen as a set of measures for the study. As well as the two psychological constructs of everyday memory and mood, scales were chosen to control for the effect of known possible confounding variables. Each will be described in turn.

1. Measuring Everyday Memory

The Rivermead Behavioural Memory Test - Extended Version (RBMT-E). (Wilson, Clare, Cockburn, Baddeley, Tate & Watson, 1999).

The RBMT-E has been described as a standardised and reliable measure of everyday memory (Wilson et al., 1999). To date, it has not been used with a New Zealand population. The original Rivermead Behavioural Memory Test (RBMT) (Wilson, Cockburn & Baddeley, 1985) was designed to predict everyday memory

problems in people with acquired, non-progressive brain injury, and also to monitor change over time (Wilson et al., 1999). The RBMT has been shown to be a useful tool in the measurement and prediction of everyday memory problems (van Balen, Westzaan & Mulder, 1996).

Inter-rater reliability has been shown to be 100% for both profile and screening scores. Also, parallel-form reliability has been demonstrated between versions A and B, C and D as 0.86, 0.83 and 0.88 respectively (Wilson et al., 1985). The RBMT has been used with New Zealand populations, has excellent face validity and a recognised ecological validity (Fraser, Glass & Leathem, 1999). Normative data for a New Zealand population of 131 elderly people (60-89) recently established (Fraser et al., 1996). In addition to issues of reliability and validity, the design of four different versions allowed repeated assessments while minimising practice effects (Wilson et al., 1989).

The extended version of the Rivermead (RBMT-E) has been developed in order to enhance the sensitivity of the RBMT by increasing the difficulty of the test. Versions A and B of the RBMT have been combined to make Version 1 of the RBMT-E, and Versions C and D have been combined to make Version 2 of the RBMT-E. This has resulted in an extension the original RBMT from that of a screening test, to a test providing a sensitive measure of memory within a normal range (de Wall et al., 1994).

The extended version has been designed to follow the original structure so as to capitalise on the established validity and sensitivity of the original RBMT (Wilson et al., 1999). In a pilot study (de Wall et al., 1994) found that the RBMT-E significantly discriminated between a middle-aged (40-55 years) and older group (65-79 years), even when these differences were small as measured by the Warrington Recognition Memory Test (Lezak, 1995). Participants also included 18 individuals from African-Caribbean and Asian origin to ensure cultural appropriateness and sensitivity (de Wallet al., 1994).

The RBMT-E (Wilson et al., 1999) is comprised of two parallel versions that have been shown to be sensitive to age and IQ effects in non-brain participants. Parallel-form reliability was investigated by administering the 2 versions of the test to 191 control subjects aged between 16-76 years. Overall mean scores were very similar between the two versions (Wilson et al., 1999), although tests of significance were not reported in the manual.

The test has been shown to be capable of detecting more subtle memory deficits than the original RBMT. In a comparison of 45 neurologically impaired people on both the original and the RBMT-E, the newly extended version separated the RBMT scores into good, average, poor and impaired subgroups (Wilson et al., 1999).

In discussing the assumption that the RBMT-E is a valid measure of everyday memory, de Wall et al. (1994) cite the ecological validity of the original RBMT. This was firmly established with the use of contrasting groups for whom everyday memory problems were or were not prominent, and then subsequently validated against hours of careful observation. Correlations between therapist observations and scores obtained on the RBMT were significant (=0.75).

Materials:

The RBMT-E consists of a manual with instructions for administration and scoring of the test. A test materials book contains the sub-tests and allows the tester to read the instructions while the participant views the stimuli. In addition, supplementary items include a large picture card with 15 items (picture recognition), a message envelope (route & messages) and a timer. A scoring sheet (Appendix 2), which is also a procedural guide is included.

Sub-tests:

The RBMT-E is comprised of 11 sub-tests:

** Sub-test 1& 2 - First and Second Names.*

The participant is shown three photographic portraits and asked to remember the first and second names of all three people in the photographs. The participant is required to recall the names at the end of the test. Each name recalled without a prompt is scored 2, recalled after a prompt is scored 1.

** Sub-test 3 - Belongings.*

Two possessions belonging to the participant are borrowed and secreted in a desk drawer and a cupboard (or suitable alternatives). The participant is requested to ask for the belongings at the end of the test session, and to remember where they have been hidden. Each item recalled without a prompt is scored 2, recalled after a prompt is scored 1.

** Sub-test 4 - Appointments.*

This sub-test assesses response to cueing. The tester sets an alarm for 20 minutes time. The participant is required to ask two questions relating to the near future, when the alarm sounds. For Version 1, the questions are "When do I have to see you again?" and "When does this session end?" For Version 2, the questions are "When will I know the results of the test?" and "What time do we finish today?" The participant is told to remember to ask both questions when the alarm sounds. If the participant does not ask the questions spontaneously when the alarm sounds, prompts are given (e.g., "What were you going to do when the alarm rings?"). Each question asked spontaneously scores 2, each question after a prompt is scored 1.

** Sub-test 5 - Picture Recognition (Presentation).*

The participant is shown 20 line drawings simultaneously on a large sheet of card. Participants are requested to memorise as many as they can in 15 seconds, and to recognise these later on from a set of 40. The tester informs the participant of the time after 5 and 10 seconds. At 15 seconds, the tester informs the participant that

'time's up'. The raw score is obtained by deducting the number of false positives from the number of original pictures correctly identified. Maximum score=20

** Sub-test 6 - Story (Immediate).*

The participant is asked to listen to a short passage of prose being read out, and then to immediately recall as much of it as possible. (The participant is asked to recall the story again later in the testing procedure, without a second reading). The authors (Wilson et al., 1999) make particular note that certain names and possibly a few words are culture specific. The tester is advised to change names/words to suit the culture of the participant. Later, after appointments, the tester asks the participant to recall the prose passage (story delayed). For scoring, the story is divided into 21 ideas with each idea that is recalled perfect or close =1. Guidelines are given in an appendix for scoring 1/2 a point for partial or approximate synonyms. Maximum score 21.

** Sub-test 7 - Face Recognition (Presentation).*

The participant is shown pictures of 15 faces, one at a time for 3 seconds each. The participant is asked to decide whether the person in the photo is under or over 40 years old. The participant is later required to select the original 15 from a set of 30. Scoring is obtained by deducting the number of false positives from the number of original faces correctly identified. Maximum score 15.

** Sub-test 8 - Route (Immediate) and Sub-test 9 - Messages (Immediate).*

The tester traces a short route within the room. The route comprises of 7 sections. The participant is asked to retrace the route immediately. An example is given in the manual - two chairs, a door, a window, a heater, table and noticeboard. After the story delayed, the participant is required to retrace the original route with the messages ('Route' and 'Messages Delayed'). If the message envelope and book are not spontaneously picked up, a prompt is again given (e.g., "I took two things with me"). Maximum score 15.

** Sub-test 10 & 11 - Orientation and Date.*

The participant is asked 13 questions pertaining to their present situation (e.g., "what year, month, day, time, date; name of place, city, age and year of birth; present and previous Prime Ministers, present and previous Presidents of the USA?"). Maximum score = 14, with 2 points awarded if date is correct.

After completion of the story, route and messages (delayed), the original three portrait photographs are represented one at a time. Initial letters are provided as prompts if response is not spontaneous. The test ends with the tester informing the participant, "We have finished this test" as a cue to see of they remember to ask for their belongings, and where they has been placed. If the participant does not request their belongings, the tester prompts with "You were going to remind me to give you some things".

Scoring:

Because sub-test raw scores have different minimum and maximum scores, conversion to sub-test profile scores is required. The development study (Wilson et al., 1999) used box plot analysis for this purpose and further adjustments were made for observed age and IQ effects in this study. In the present study, adjustments were performed as per the manual. Sub-tests that were adjusted for age effects were; 'Route Immediate' and 'Route Delayed'; sub-tests adjusted for IQ effects were; 'First Names', 'Second Names', 'Story Immediate' and 'Story Delayed'. The raw scores of sub-tests 3 and 4 (i.e., 'Belongings and Appointments') were summed to create a 'Prospective Memory' sub-test before conversion to a profile score. Individual Profile sub-tests have a maximum score of 4 points and are summed to create a total profile score (maximum - 48 points). In addition, five classifications of an overall profile of memory are calculated. These classifications are; impaired (0-18), poor (19-27), average (28-36), good (37-42) and exceptionally good (43-48)(Wilson et al., 1999).

2. Measuring Mood

Mood was operationally defined first as a mild, usually transitory emotion (Chaplin, 1985), and this was measured by the Profile of Moods Questionnaire (McNair, Lorr & Droppleman, 1992). Second, the construct of mood was extended to embrace the two dimensions (positive and negative) of the broader structure:- affect. This was measured by the Positive and Negative Affect Scale (Watson, Clark & Tellegen, 1988).

Profile of Moods Questionnaire (POMS).

The POMS has been used widely as a measure of transient mood states (Nyenhuis, Yamamoto, Luchetts, Terrien & Parmenter, 1999) and also for depression (Lezak, 1995).

The POMS utilises a specific affects approach which emphasises the multiple unique dimensions of mood and includes constructs such as Depression, Tension, Anger, Vigor, Fatigue, and Confusion. Examples of descriptive feelings are Depression, 'unhappy', 'sad', and 'blue; Tension, 'shaky', and 'panicky'; Anger, 'peeved' and 'annoyed'; Vigor, 'lively' and 'active; Fatigue, 'worn out', and 'listless'; Confusion, 'muddled' and 'forgetful'. Participants are asked to rate on a 5 point scale (0, 'Not at all', to 4, 'Extremely') (see Appendix 2). The summation of the sub-scale measures (vigor is weighted negatively), allows a description of a total mood disturbance, with a high score indicating a greater mood disturbance (McNair et al., 1992).

The POMS has shown good reliability and validity, and factor analyses have confirmed consistency with reasonably good test-retest correlations (Lezak, 1995). Convergent and discriminant validity has been shown to be good (Nyenhuis et al., 1999), with the POMS scales more highly related to corresponding measures of mood than non-mood scales. Furthermore, the POMS correlated highly with the BDI depression scale, and the visual analogue mood scale.

The POMS has been shown to be a reliable and valid measure for mood states in older adults (Gibson, 1997), and has been used in several studies involving menopausal women (Kimura et al., 1995; Slaven & Lee, 1994, 1997, 1998; Schiffman, Satteley-Miller, Suggs & Graham 1995; Adams, Cartwright, Ostrove, Stewart & Wink, 1998).

Positive and Negative Affect Scale (PANAS).

The PANAS (Watson, Clark & Tellegen, 1988) is a 20-item scale, developed to measure affect. In particular, the PANAS was designed to capture the two identified, highly distinctive dimensions (positive affect, and negative affect). Such distinction has been supported by low correlations between the two dimensions (range: -0.12 to -0.23) (Watson et al., 1988).

The PANAS lists 20 mood descriptions (10 describing a positive affect scale, 'Positive Affect') and (10 describing a negative affect scale, 'Negative Affect'). Participants rate on a 5 point scale (very slightly or not at all, a little, moderately, quite a bit and extremely), the extent to which they have been experiencing each (see Appendix 2). Examples of 'Negative Affect' include 'distressed', 'upset' and 'guilty', while 'Positive Affect' examples include 'excited', 'strong' and 'enthusiastic', with a high score indicating a high degree of positive affect. The positive and negative affect items are summed separately for scoring (range 10-50 for each scale), to create a 'Positive' and 'Negative' Affect variable label in the present study. High scores mean a greater degree of negativity or positivity.

Various time instructions can be used with the PANAS ranging from the present moment to feelings generally. For the present study, participants were asked to indicate the extent of each feeling 'during the past week'. The PANAS also showed good convergent validity with a variety of other brief affect measures (0.76 - 0.92) (Watson et al., 1988).

The normative data for the PANAS was gathered in the main from college student population (Watson et al., 1988). In an effort to report generalisability to a non-student population, 164 non-student adults were also tested. Alpha reliabilities of the 'Positive' and 'Negative Affect' were 0.86 and 0.87 respectively, with a correlation between the scales of .09 and Watson et al. (1988) believe the PANAS is able to offer useful information in adult samples. Mackinnon et al. (1999), examined the applicability of the PANAS across the life span, with a large sample (n=2651) 18-79 year olds. Factor structure and factor correlations did not appear to change with age.

3. Measuring Confounding Variables

Copies of the measures chosen to control for the effect of possible confounding variables are shown in Appendix 2. These included the Women's Health Questionnaire (WHQ) and the Short-Form Health Survey (SF 36). The National Adult Reading Test (Nelson, 1982; Nelson & Williston, 1991) was used in order to provide a pre-morbid estimation of intelligence, and the Digit Span (Wechsler, 1981) as a measure of attention and short-term memory. A measure of the number of life change events, the Social Readjustment Rating Scale (Holmes & Rahe, 1967) was employed to control for the possibility of stress.

Women's Health Questionnaire (WHQ).

The Women's Health Questionnaire was specifically developed by Hunter (1992) to measure the wide range of physical and emotional symptoms experienced by mid-life women aged 45-65 years. It was designed to identify changes that may occur throughout the menopause transition, and to allow the assessment of the individual effects of symptoms that may arise (Hunter, 1992).

The WHQ consists of 36-items that reflect somatic, vasomotor, memory, concentration, sexual behaviour, sleep, menstrual, depressed, and anxious mood symptoms which the participant rates on a 4 (0-3) point scale (No, Not at all; No, not much; Yes, sometimes, and Yes, definitely) (see Appendix 2). Examples of

these sub-scales are; somatic, 'My stomach feels bloated'; vasomotor, 'I suffer from night sweats'; memory and concentration, 'my memory is poor', I have difficulty in concentrating'; sexual behaviour, 'I have lost interest in sexual activity'; sleep, 'I have difficulty in getting off to sleep', menstrual, 'I have heavy periods'. In the present study, the depressed and anxious factors were omitted as they were thought to be adequately assessed with the POMS and the PANAS. Hunter (1992) acknowledges that not all the scales will be of interest in every study, and that smaller sub-scales may be omitted. Furthermore, the presence of a separate factor to assess sleep difficulties is a particular strength of the WHQ when considering the performance of memory in mid-aged women. For scoring, symptom items for each sub-scales were summed and divided by the number of items in each sub-scale. A total score allows an overall measure of well-being with a higher score reflecting more disturbance.

Several studies involving menopausal women have utilised the WHQ (Wilkund et al., 1992; Greensmith, 1991; Slaven et al., 1997, 1998), and it has been found to be a sensitive measure of response to hormone replacement therapy. Test - retest reliability was assessed after a two-week period and correlations between sub-scales ranged between 0.69 and 0.96.

Short-Form Health Survey Questionnaire (SF-36).

The SF-36 (Ware & Sherbourne, 1992), was constructed to survey health status and designed for use in clinical practice or research, health policy evaluations and general population surveys. The SF-36 is a 36-item questionnaire that measures eight multi-item dimensions tapping functional status, well-being and overall evaluation of health. Functional status evaluates physical and social functioning, as well as role limitations occurring as a result of physical and/or emotional problems. Physical functioning lists 10 activities, and asks the participant to rate how their health limits them on a 3 point scale (Yes, limited a lot; Yes, limited a little, and No, not limited at all). Social functioning asks the participants to rate on a 5 point scale (from all to none), how much time physical health and emotional

problems interfered with their social activities. An emotional and physical role limitation scale allow a yes/no rating (range 1-2). The well-being scale assesses general mental health (e.g., 'Have you been a very nervous person') and bodily pain (very severe to no bodily pain) and vitality (e.g., Do you feel full of life). A further scale evaluates general health perception, and also includes one non-scaled item that asks participants about health change over the past year (Jenkinson, Wright & Coulter, 1994). High scores on 'Functional Status', 'Wellbeing' and 'Health Evaluation' indicate the best possible health state.

The questionnaire is designed, and has been used successfully for self-administration, telephone administration, or administration during a personal interview (Ware et al., 1992). McHorney, Ware, Lu, & Sherbourne (1994) undertook tests of data quality, scaling assumptions and reliability across diverse patient groups, and found that all scales passed tests for item-internal consistency and item-discriminant validity. Reliability coefficients ranged from 0.65 to 0.94 across scales. Jenkinson et al. (1994) found internal consistency to be good, with alpha values > 0.8 for all dimensions of the SF-36 except for the social functioning scale. Jenkinson et al. (1994) also reported the ability of the SF-36 to discriminate between different groups of respondents (those reporting poor to excellent health). As the authors assert, this suggests that the questionnaire is a suitable instrument for use in homogeneous groups.

The validity of the SF-36 has been criticised on the grounds that it does not contain items about sleep (Hunt & McKenna, 1993). To investigate this further, Lyons, Fielder & Littlepage (1993) used the SF 36 in a study on health status, and additionally asked questions of participants regarding any 'problems sleeping' experienced. Participants that reported treatment for a sleeping disorder were found to have lower scores on all the SF 36 variables and Lyons et al. (1993) suggest that the lack of questions about sleep does not detract from the validity. A later study (Zammit, Weiner, Damato, Sillup, & McMillan, 1999) confirmed the findings of Lyons et al. (1993). Participants with insomnia also obtained lower mean scores on sub-scores of the SF-36 indicating widespread impairment.

Although the validity of the SF-36 is confirmed, without specific sleep questions, the association of sleep difficulties with memory performance is difficulty to identify. Sleep difficulties are a common complaint of menopausal women and are also correlated with poor cognitive performance (Hunter, 1992; Weiten, 1995). For the purposes of the current study, sleep difficulties were assessed as a separate factor within the WHQ as outlined above.

The acceptability, reliability and validity of the SF-36 has been assessed in a New Zealand Population (Scott, Tobias, Sarfati, Haslett, 1999). Apart from some data incompleteness problems and skewed responses in population samples, the SF-36 is thought to be a valid and reliable measure of health-related quality of life for a New Zealand population.

For the present study, it was thought that the SF-36 would allow a multidimensional assessment of health and enable a comprehensive understanding of the impact of the transition through menopause on women at mid-life. This type of assessment was thought to be essential in order to be able to capture the range of effect, and also distinguish the degree of impact of the multiple symptoms that women often present with during this period.

Digit Span (Wechsler Adult Intelligence Scale-R).

The 'Digit Span' is considered to be a measure of short-term memory (immediate verbal recall) and attention (Lezak, 1995). Participants must recall and repeat auditory information (two to nine digits) in proper sequence. 'Digits Forward' is more simpler and straightforward, whereas 'Digits Backwards' requires the memory to be held longer and transformed before a restatement (Groth-Marnet, 1997). In contrast to 'Digits Forward', 'Digits Backward' is a more effortful activity and calls upon working memory (Lezak, 1995). Digits are presented at a one per second rate and are continued until the participant fails a pair of sequences or repeats a nine digit correctly (Lezak, 1995).

The normal range for 'Digits Forward' is 6 +/- 1. Education appears to have a decided effect on this task whereas age affects minimally and only after 65 -70 years (Lezak, 1995). The normal range for 'Digits Backwards' is considered to be a raw score of 4-5 and has been shown to be more susceptible to age. Test-retest reliability ranges from 0.66 to 0.89 depending on age and interval length (Lezak, 1995).

Each item is scored 0 (if participant fails both trials), 1 (passes only one trial), or 2 points (passes both trials). This provides three maximum scores; 'Digits Forward' (16) 'Digits Backward' (14) and a combined score of 30 (Wechsler, 1981). The use of the Digit Span in the current study also allowed a relatively quick measure of simple attention which is not present in the RBMT-E.

The National Adult Reading Test (NART-2).

The NART (Nelson, 1982, Nelson et al., 1991) is recognised as an estimated measure of pre-morbid intellectual ability, more specifically crystallised intelligence (Lezak, 1995; Parkin & Java, 1999). Crystallised intelligence is theorised to reflect acquired knowledge and as such seems to exhibit stability throughout the adult span (Cattell, 1987 cited in Schaie & Willis, 1996). The stability is thought to be due to the supportive nature of the environment (Schaie et al., 1996). In contrast, fluid intelligence is described as independent of acquired knowledge, and observed declines are linked to declining neural substrate (Schaie et al., 1996). For the present study, the use of the NART was required in order to score the RBMT-E.

The assessment of deterioration (especially when mild), without an estimate of prior functioning makes it difficult to determine the extent of cognitive impairment (Nelson, 1992). Following substantive data that demonstrated a high correlation between word-reading ability and general intelligence (Nelson & McKenna, 1975) cited in (Nelson et al., 1991), the NART was specifically developed in order to provide a measure of estimation of pre-morbid ability and so improve the detection of deterioration.

The NART comprises 50 words that are phonetically irregular and arranged in order of increasing difficulty (Nelson et al., 1991; Lezak, 1995). The phonetic irregularity minimises the likelihood of words being read as the result of a "phonemic decoding", rather than word recognition (Nelson et al., 1991, p2.). Each incorrectly pronounced word is counted as one error, contributing to a NART error score (50 minus the number of words read correctly).

The insertion of the error score into an equation results in the prediction of WAIS - R IQ scores (Full-scale, Verbal and Performance). A discrepancy between the Full-scale IQ obtained at testing and that scored by the NART error score, suggests the individual may have functioned at a higher intellectual level previously. Such a discrepancy then may reflect deterioration. The equation used by Nelson et al. (1991) was Full-scale = 130.6 - 1.2 X NART error score; Verbal IQ = 127.4 - 1 .14 X NART error score; Performance IQ = 127.8 - 1.10 X NART error score.

Described as one of the "most reliable tests in clinical use" (Spreen & Strauss, 1998, p.8), the NART reports an internal consistency reliability estimates of over 0.90. The NART has been shown to have a high test-retest reliability: - 0.98 ($P< 0.01$) (Crawford, Parker, Stewart, Besson & deLacy, 1989). Inter-rater reliability was also high (above 0.88), although disagreement was noted for particular words and recommendations for care in scoring these words given (Crawford et al., 1989). High correlations between the NART and measures of general intellectual ability and education have been reported (Crawford et al., 1991).

The Wechsler Intelligence Scale has largely been used as the criterion variable and has shown good accuracy confirming the NART as a reliable predictor of verbal intelligence in particular (Spreen et al., 1998). However, the NART has also been shown to estimate pre-morbid performance on other cognitive tasks (FAS verbal fluency task, the PASAT - Crawford et al., 1992, and in press, cited in

Spreen et al., 1998). In addition, NART equations based on memory test performance have also been suggested as capable of assessing dementia earlier that a NART/WAIS-R combination (Schlosser & Ivison, 1989). Spreen et al. (1998) suggest predictive accuracy may be increased by combining the NART with demographic data, and other measures of performance and recommend the NART be supplemented with clinical observations and information about individual's educational and occupational accomplishments.

Social Readjustment Rating Scale (SRRS)(Holmes & Rahe, 1967).

This is a measure of life change as a form of stress. The scale assigns numerical values to 43 major life events (e.g., 'Death of Spouse' =100; 'Minor Violations of the Law' =11). These values are meant to reflect the magnitude of readjustment required by the change. Respondents are asked to indicate how often any of the events are experienced during the last year. Scoring involves summing the numbers, and the total is regarded as an index of the amount of change-related stress the person has recently experienced (range 11-1,246). Over the years, high scores on the SRRS have been shown to be related to a vulnerability to many types of physical illnesses and psychological problems (Weiten, 1995).

Since the development of the SRRS, there has been debate as to exactly what is the crucial dimension the SRRS measures, although it continues to be recognised and employed as a useful measure of a wide range of stress experiences (Weiten, 1995). The SRRS was utilised as part of a wider study assessing the prevalence of stressful experiences in mid-aged women, and also allowed for the assessment and control of the possible effect of stress as a confounding variable on the relationship between HRT use and memory function.

4. Measuring Demographics Information and Medical History

Demographic data (Table 1), included information concerning age, ethnic background, education, employment status, and exercise. Information regarding participants' history of head injury, and family history of neurological conditions was

requested, as well as questions regarding history of smoking, diseases such as diabetes, hypertension, heart disease, cancer, epilepsy, depression, and pre-menstrual tension or symptoms. A history of hysterectomy or ovarian surgery was sought, together with information as to whether it had been 12 months since the last menstrual period. The participants were also asked to describe their own menopausal status (pre-menopausal, menopausal or post-menopausal). A criteria of six months cessation of periods, together with hot flushes or night sweats was prescribed for the menopausal status to be confirmed. HRT use was clarified and any other medications taken (prescribed or over the counter) noted.

PROCEDURE:

Ethics Approval

Ethics approval was granted by the Massey University Ethics Committee, Palmerston North.

Advertisements

The Christchurch Star agreed to place advertisements in The Star and their affiliated Community Newspapers. A health reporter from a magazine that is placed in all Doctor's surgery's and health clinics at local hospitals and rest homes saw the advertisement, contacted the researcher and as a result, an interest article was also published. Prime Television saw the newspaper article and contacted the researcher to appear on their 'Midday' programme to explain the project. Following this, several women contacted the researcher expressing a desire to take part in the study. In addition, as each person was tested, they were asked to mention the study to others who might be interested, leaving that person to contact the researcher if interested.

Response

There was a very good response from women to the newspaper advertisements, with considerable interest and awareness of current memory problems being

expressed to the researcher. Women who responded to the advertisements by telephone were given a brief verbal explanation and offered the information sheet (see Appendix 3), which was mailed or faxed to women. On most occasions during the telephone contact, women expressed satisfaction with the information given, and expressed an immediate desire to set up an appointment for the interview. At this time, the researcher took care to ensure that the participant understood that the information sheet would be presented by the researcher on arrival, and that the information sheet would need to be read by the participant at that time. In addition, the researcher told the women that any further questions would be answered at this time, and that they could also choose to withdraw from further participation at any time. A consent form (see Appendix 3) was signed after the information sheet had been read.

Data Collection

Data were collected through the administration of the practical RBMT-E sub-tests and written questionnaires to individual women. This was undertaken in their own home or at the home of the researcher, whichever was more convenient for the respondent.

Test Administration

Each participant then completed the questionnaires in the following order: Demographic information, WHQ, and the SF-36. The RBMT-E test was followed by the PANAS, POMS, Life Events questionnaire. On occasion the RBMT-E was administered fairly quickly. When this occurred, the point at which the test does not proceed further would be reached prior to the alarm ringing (i.e., before 20 minutes had lapsed). This left some time for the researcher to 'engage the participant in conversation' (see test administration book, p.187). Often, this proved a good time for a cup of coffee, or alternatively, the mood questionnaire and life events were completed during this time. The administration of the Digit Span and the NART completed the testing procedure. The Digit Span was so

positioned because, in an initial evaluation of the possible order effects of questionnaire presentation, it had appeared to raise anxiety levels.

Researchers

Initially, two researchers were employed: one in Palmerston North who interviewed participants at the University Psychology Clinic, and one in Christchurch (as described above). This allowed the use of the two parallel versions of the RBMT-E. An identical order of test administration and procedure was used by both researchers.

Inter-rater Reliability

Inter-rater reliability tests were carried out in Palmerston North (PN). Data from a sample of six university staff and students were collected allowing a comparison of the ratings by the two researchers. The inter-rater reliability tests included data from the Digit Span, NART and the RBMT-E. The inter-rater data is as follows: Digits Total: r (6)= .97; Digits Forward: r (6)= .87; Digits Backward: r (6)= .96. The NART: r (6)= .95. The RBMT-E Total: r (6)= .47;

Pearson correlations were also obtained for each of the sub-tests of the RBMT-E. They are as follows: First Name: r (6) = .58; Second Name: r (6) = .84; Picture Recognition: r (6)= .30; Story Immediate: r (6) = .23; Story Delayed: r (6) = .28; Face Recognition: r (6) = -.25; Route Immediate: r (6)= .13; Orientation & Date: r (6)= .63.

The inter-rater results for the RBMT-E were generally very poor, especially when considering previous reports from the RBMT. This introduced some doubt as to the reliability of these particular sub-tests and also the total memory score. The significance of these inter-rater data results in the use of the RBMT-E is elaborated further in the discussion below. Because of concern about the inter-rater reliability and constraints of time, data used for hypothesis testing in this study was collected in Christchurch by one researcher, the present author.

Statistical Analyses

Analyses were run using SPSS software, version 9. Demographic characteristics of the two groups were compared using one way anova or chi square as appropriate with alpha set at $p<.05$. Means and standard deviations were computed for the total profile scores and for each of the sub-test scores (raw and profile) of the RBMT-E. Means and standard deviations were also computed for each of the other variables measured.

Assessment of the utility of the RBMT-E included a comparison of mean scores of the development study (Wilson et al., 1999) and an examination of frequency distributions for each sub-test to identify any possible floor and ceiling effects. In addition, observations were made regarding issues such as face validity for this particular population, together with any difficulties that were noted during the administration and scoring as well as age effects on the RBMT-E. Because of the inter-rater difficulties, only Version 2 of the RBMT-E was used. This meant that the planned comparisons between the two versions was not possible.

CHAPTER 6

RESULTS

PREPARATION OF DATA AND PRELIMINARY ANALYSES

Following entry of the raw data into SPSS, initial checks were undertaken to ensure the accuracy of entry. This included random selection of the data from the original coding sheets on paper and cross checking these with the computer entries. Frequencies and frequency distributions were examined to check for any missing and any out of range values. There was one set of missing data for one participant (life events questionnaire), that the researcher had omitted to give the participant. Because it was not thought that this small amount of missing data would impact on any variance, a group mean was calculated from the available data and used to replace the missing data prior to analysis.

Normality of distribution was examined with histograms. Skewness and kurtosis statistics were calculated for all variables. A positive skewness was found for the NART, 'Negative Affect', and 'Depression' variables. Negative skewness was apparent for the 'Messages Delayed', 'Route Immediate' and 'Route Delayed' sub-tests. Logarithmic transformations were conducted for these variables, resulting in approximately normal distributions for regression analysis.

An evaluation of multivariate assumptions of normality was achieved by examining residual properties. The assumptions of normality of distribution, homoscedasticity, linearity and independence of residuals were met.

Analysis of Data

Chi-square analysis revealed no significant differences between the HRT use and non HRT use groups in ethnicity, education, employment status, IQ, or the use of concomitant medication. Table 5 shows the significant differences in menstrual

status and surgical history found between the two groups. These were found for menopausal status, χ^2 (2) = 12.0, p<.01; last menstrual period, χ^2 (2) = 7.97, p<.01; both ovaries removed, χ^2 (1) = 5.05, p<.05; uterus removed, χ^2 (1)= 3.68 p<.05; and those reporting the removal of one ovary, χ^2 (1) = 6.74, p<.01.

Table 5.
The variables that were significantly, differently, distributed between the two HRT use groups, showing the number and percentage in each group.

	HRT use (n=53)	non HRT use (n=51)
Menopausal Status		
Pre-menopausal	7 (13.2%)	21 (41.1%)
Menopausal	22 (41.5%)	19 (37.0%)
Post-menopausal	24 (22.08%)	11 (21.5%)
Hysterectomy	23 (43.4%)	13 (25.4%)
Ovarian surgery	14 (26.4%)	1 (2.0%)
Last Menstruation > 12 months	15 (28.3%)	11 (21.5%)

One-way Anova showed no significant differences between the groups on any measures of age, mood, affect, stress, and general health. Table 6 shows the mean and standard deviations for the digit span measure of attention and short term memory. There was no significant difference and both groups were shown to have spans within the expected range. Significant differences were found for vasomotor, F (1, 102) = 5.93, p<.05), and menstrual symptoms, F (1,102) = 7.44, p<.05), from the measure of general well-being (WHQ). Comparison means and standard deviations for the WHQ, mood (POMS) scores, affect and psychological well-being/distress (PANAS), general health (SF36), and stress scores are shown for both groups in Tables 7,8,9,10, and 11 below.

Table 6.
Digit Span Mean and Standard Deviation Scores for HRT use groups.

	HRT use (n-53) Mean (SD)	non HRT use (n=51) Mean (SD)
Forwards	10.62 (2.35)	10.31 (2.40)
Backwards	7.45 (2.61)	6.84 (2.26)
Total	18.08 (4.45)	17.16 (4.02)

Table 7.
Sub-scale Mean Scores from the Women's Health Questionnaire for HRT users and non HRT users

WHQ	HRT users (n=53) Mean	(SD)	non HRT users (n=51) Mean	(SD)
Memory/Concentration	1.08	(.70)	1.18	(.73)
Somatic Symptoms	.84	(.60)	.90	(.70)
Vasomotor Symptoms	.43	(.60)**	.91	(1.03)**
Sexual Behaviour	.84	(.90)	1.01	(.98)
Sleep Problems	.98	(.83)	.89	(.74)
Menstrual	.49	(.52)**	.86	(.85)**
Total Score	4.66	(2.66)	5.76	(3.62)

*$p<.05$

Non HRT users reported more problems on the vasomotor (hot flush) symptom sub-scale t (102)= -2.88, $p<.05$ and reported more menstrual symptoms t (-2.73)= -2.73, $p<.05$ than HRT users. Overall, non HRT users achieved higher total score reflecting the greater symptom experience or more difficulties in all of the sub-scales except sleep.

Table 8 below shows the mean and standard deviation scores for each of the POMS sub-scales as well as a total mood disturbance score. The lower score on total mood disturbance reflects a more positive mood.

Table 8.
Profile of Mood Scores for HRT users and non HRT users.

POMS Sub-scales	HRT use (n=53) Mean (SD)		non HRT use (n=51) Mean (SD)	
Tension	3.34	(5.59)	4.0	(5.1)
Depression	6.83	(7.95)	9.0	(8.8)
Anger	7.43	(6.16)	7.4	(6.5)
Vigor	12.38	(5.20)	10.7	(5.7)
Fatigue	7.70	(6.60)	8.7	(6.5)
Confusion	2.60	(4.30)	3.9	(5.3)
Total Mood	15.60	(27.6)	22.3	(30.1)

Note. Total Mood = Total Mood Disturbance Score.

HRT users achieved consistently lower scores than non HRT users on the tension, depression, fatigue and confusion components of the POMS, as well as reporting a total lower mood disturbance score. HRT users reported a higher score on the vigor sub-scale. None of these differences approached significance.

Table 9 shows the mean and standard deviation scores for the two components of the PANAS for the two groups.

Table 9.
Positive and Negative Affect Mean and Standard Deviation Scores for HRT users and non HRT users.

PANAS	HRT users (n=53) Mean (SD)	non HRT users (n=51) Mean (SD)
Positive Affect	22.6 (6.04)	21.0 (6.04)
Negative Affect	15.17 (5.70)	15.7 (6.22)

Although HRT users reported a slightly higher positive affect score, no significant differences were found between the two groups on psychological well being or distress as measured by the Positive and Negative Affect scale. Table 10 shows the mean and standard deviation scores obtained on the SF-36, showing participants' evaluations of health, functional status and well-being.

Table 10.
Evaluation of Health, Functional Status and Well-being Sub-scale Scores of the Short Form Health Survey (SF-36) for HRT users and non HRT users.

SF-36	HRT users (n=53) Mean (SD)	non HRT users (n=51) Mean (SD)
Health Evaluation	19.98 (3.4)	20.02 (3.5)
Functional Status	49.02 (6.2)	48.31 (6.27)
Well-being	48.62 (5.8)	47.70 (7.45)

Note. No significant differences between the two groups were found for any of the components of these sub-scales prior to computation.

The higher scores on the SF 36 reflect a higher health status and no significant differences appeared between the two groups.

Table 11 shows mean and standard deviation scores reported for the frequency of life events and a weighted index of the impact of these events.

Table 11.
Mean and Standard Deviation Scores achieved on the Social Readjustment Rating Scale for HRT users and non HRT users.

SRRS	HRT users (n=53) Mean	(SD)	non HRT users (n=51) Mean	(SD)
Life Events (Frequency)	5.9	(3.83)	7.50	(4.8)
Life Events (Weighted Points)	176.7	(114.35)	215.98	(137.05)

Although non HRT users reported more stressful events and accumulated more points when the life events were weighted, few differences were found between HRT users and non HRT users in either the frequency of observed life (stressful) events, or on the total life event impact score when point values were calculated.

HYPOTHESIS 1

Women who use HRT will show better everyday memory ability than those women who do not use HRT, while controlling for age, affect, mood, health, education and stress. In addition, it is expected that verbal memory will show the greatest difference between the two groups.

Results of independent *t*- tests showed significant differences for three of the sub-tests of the RBMT-E: 'Story Immediate', t (102) =2.03, p<.05; 'Story Delayed', t (102) = 2.00, p<.05, and 'Messages Delayed', t (102)=1.99, p<.05. A significant difference t (102)= 1.57, p<.05 was found between the two groups on the 'Total Profile RBMT-E. Comparisons of HRT and non HRT users' raw scores (means and standard deviation), of all sub-tests are shown in Table 12.

Table 12.
Sub-test Mean Raw Scores on the RBMT-E for HRT and non HRT users.

	HRT use (n=53) mean (SD)	non HRT use (n=51) mean (SD)
First Names.	3.75 (1.87)	3.27 (1.78)
Second Names.	2.87 (2.20)	2.47 (1.98)
Belongings	5.91 (1.98)	6.24 (1.86)
Appointments	3.09 (1.35)	2.94 (1.41)
Picture Recognition	14.21 (3.52)	14.25 (3.13)
Story Immediate	8.89 (3.23)	7.69 (2.77)*
Story Delayed	8.17 (3.38)	6.96 (2.73)*
Face Recognition	13.19 (1.70)	12.92 (1.40)
Route Immediate	14.57 (0.84)	14.35 (0.87)
Route Delayed	14.45 (0.93)	14.29 (0.99)
Messages Immediate	5.68 (0.75)	5.51 (0.88)
Messages Delayed	5.79 (0.60)	5.51 (0.83)*
Orientation and Date	13.38 (0.77)	13.25 (0.80)
Sub-Test Total	113.06 (12.40)	109.63 (9.67)
Prospective Memory	9.00 (2.46)	9.18 (2.27)

* $p<.05$.

Only three sub-tests, 'Story Immediate' and 'Story Delayed' as well as 'Messages Delayed' reached significance. The comparison of the raw and profile sub-test scores can be seen in Table 13. The significant difference found for the three sub-tests in the raw scores was maintained after the conversion to profile scores. The calculation of a total profile score resulted in a significant difference between the two groups in the overall measure of everyday memory

Table 13.
RBMT-E Sub-test and Total Profile Scores: Means and Standard Deviations.

	HRT users (n=53) Mean (SD)	non HRT users (n=51) Mean (SD)
First Names	2.13 (1.4)	1.67 (1.3)
Second Names	1.90 (1.3)	1.70 (1.2)
Belongings & Appointments	1.50 (1.6)	1.50 (1.6)
Picture Recognition	2.20 (0.95)	2.20 (0.81)
Story Immediate	1.41 (0.71)	1.10 (0.65)*
Story Delayed	1.67 (0.75)	1.30 (0.65)*
Face Recognition	2.54 (1.13)	2.37 (0.9)
Route Immediate	3.60 (0.59)	3.40 (0.77)
Route Delayed	3.70 (0.50)	3.60 (0.55)
Messages Immediate	3.70 (0.75)	3.50 (0.88)
Messages Delayed	3.80 (0.6)	3.50 (0.84)*
Orientation & Date	3.70 (0.76)	3.30 (0.80)
PROFILE	31.64 (5.28)	29.27 (4.31)*

* $p<.05$.

HYPOTHESIS 2

Memory ability will decline with increasing age. Bivariate correlations of age as a continuous variable with the sub-tests of the RBMT-E failed to find a significant relationship, and although some sub-tests did reveal a negative direction, the strength of the relationship was not significant.

HYPOTHESIS 3

Age will moderate the relationship between HRT use and memory ability. Any differences in memory ability between HRT users and non HRT users will be greatest for older women.

The interaction of age and HRT use was tested in a series of hierarchical regression equations with each RBMT-E sub-test profile score and total profile score as the dependent variable (DV). 'Age' and 'HRT use' were entered as independent variables (IV) at the first step. An interaction term, 'agehrt' (the product of age and HRT use), was entered at the second step. Dependent variables that showed significant interaction effects were 'Second Names' regressed on 'Agehrt', 'Belongings' regressed on ' Agehrt', and 'Belongings and Appointments' (Prospective memory), regressed on 'Agehrt'. The extra variance accounted for by each interaction variable was 3% for 'Second Names', R^2 =.03, F(1, 100) = 4.01, p<.05, and 4% for 'Belongings', R^2 = .04, F (1,100) = 4.23, p<.05, and 'Prospective Memory', R^2 = .04, F (1,100) = 4.24, p<.05. Table 14 shows the result of the regression of these three RBMT-E scores on 'age', 'HRT use' and Agehrt'.

Table 14.
Results of Hierarchical Regression of RBMT-E Sub-test Profile Scores on 'Age', 'HRT use' and 'Agehrt'.

Variables	β	R^2
Second (DV) Names		
AGE	-.06	
HRT	.10	.02
Agehrt (IV)	2.10	.05*
Belongings (DV)		
AGE	-.05	
HRT	-.07	.01*
Agehrt	2.27	.05*
Prospective (DV) Memory		
AGE	.05	.00
HRT	-.04	
Agehrt	2.28	.04*

*p<.05

Further examination of the means of HRT users and non-users above and below the median (52yrs), is shown in Table 15. Older HRT users (>52yrs) scored higher than non HRT users on 'Second Names', 'Belongings' and 'Prospective Memory'. Younger HRT users (<52yrs) scored lower on the same RBMT-E sub-tests than younger women who were non HRT users. Table 15 shows the means for the HRT use groups.

Table 15.
Means of HRT Use Groups on RBMT-E Sub-tests showing an Interaction Effect between 'Age', 'HRT use' and 'Agehrt'.

Variables	Means			
	Age<52yrs		Age>52yrs	
Sub-tests (DV)	HRT use (n=49)	non HRT	HRT use (n=50)	non HRT
Second Names	2.50	2.72	3.00	2.22
Belongings	5.79	6.80	6.00	5.57
Prospective Memory	8.79	9.60	9.33	8.65

The shape of the interaction effect was similar for all three sub-tests. Figure 1 below illustrates the form of the interaction between 'age' and 'HRT use' on the 'Second Name' sub-test of the RBMT-E.

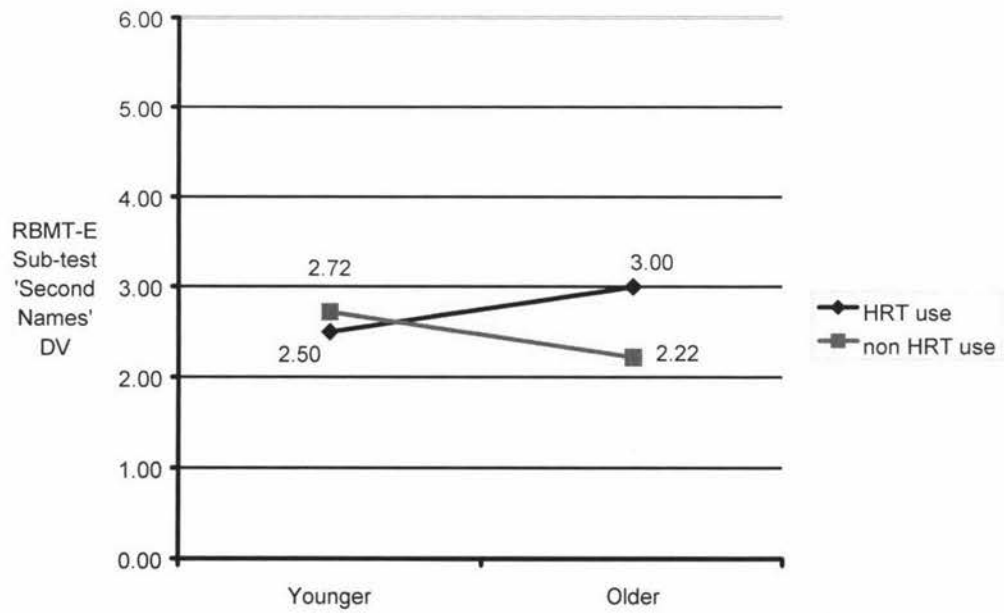

Figure 1: The form of the interaction between 'age' and HRT use on 'Second Names' sub-test of RBMT-E.

HYPOTHESIS 4

Mood will be positively related to memory ability. More specifically, positive mood will be associated with better memory, and conversely, negative mood will be associated with poorer memory ability.

Results from bivariate correlations of the raw sub-test scores of the RBMT-E with the six scales of the Profile of Moods Questionnaire and a calculated total mood disturbance score are shown together with the 'Positive' and 'Negative Affect' scales of the PANAS in Table 16. A lower total mood disturbance score indicates a higher positive mood. Generally, there was very little support for a positive association between mood and memory scores on the sub-tests of the RBMT-E. There was no significant correlation of mood with the RBMT-E Total Profile Score.

Significant positive correlations were revealed for 'Vigor' with the 'Appointments' sub-test, 'Anger' with 'Route Immediate' and 'Picture Recognition', and 'Total Mood' with 'Face Recognition'. Significant negative correlation was found between Total Mood Disturbance and 'First Names', 'Appointments', and 'Prospective Memory'.

Significant negative correlations were also found between 'Fatigue' with 'First Names' and 'Second Names', 'Appointments', and 'Story Immediate' and 'Story Delayed'. 'Tension' showed a significant negative correlation with 'Appointments' and 'Depression' with 'Orientation and Date'. 'Confusion' showed a significant negative correlation with 'First Names', 'Appointments' and 'Prospective memory'.

'First Names', 'Appointments', 'Orientation and Date', and 'Prospective Memory' showed significant negative correlations for 'Negative Affect'. 'Face Recognition ' showed a significant negative correlation with 'Positive Affect' while no sub-tests showed any positive correlation with 'Positive Affect'.

Table 16.
Correlations between RBMT-E and Profile of Mood and PANAS Sub-scale Scores.

	Depression	Tension	Fatigue	Confusion	Vigor	Anger	Total Mood	Negative Affect	Positive Affect
F. Names	-.1	-.06	-.33**	-.26**	-.17	-.04	-.22*	-.20*	.05
S. Names	-.10	-.10	-.24*	-.16	.03	-.05	-.15	-.16	-.01
Belongings	-.12	-.09	-.07	-.09	.10	-.00	-.10	-.12	.06
Appointments	-.14	-.20*	-.22*	-.20*	.23*	-.11	-.23*	-.24	.15
Picture R	.00	.16	.12	.11	-.21*	.28**	.18	.00	-.18
Story I	.15	-.05	-.28**	-.11	.15	-.05	-.18	-.14	.09
Story D	-.12	-.01	-.23*	-.08	.14	-.07	-.15	-.12	.04
Face R	.15	.14	.15	.19	-.24*	.12	.21*	.19	-.24*
Route I	.09	.15	.03	.14	-.17	.20*	.16	.11	-.18
Route D	.07	.05	.03	-.01	-.08	.11	.08	-.06	-.08
Message I	-.07	.08	.13	-.00	-.16	-.01	.07	.04	-.12
Message D	.05	.08	.00	- .06	-.04	-.02	.03	.07	-.15
O & Date	-.20*	-.14	-.14	-.15	-.09	.03	-.12	-.20*	.03
Profile Total	.14	.01	-.19	-.10	.02	.06	-.08	-.14	-.07
Prospective	-.18	-.24	-.19	-.20*	.22*	-.06	.22*	-.24	.14

***p<.01 (2 tailed)*
**p<.05 (2 tailed).*

HYPOTHESIS 5

Mood will moderate the relationship between HRT use and memory.

The interaction of mood and HRT use was tested with each RBMT-E sub-test score as the DV in a hierarchical regression equation. Each POMS sub-test score was entered as an IV at the first step. HRT use was the second IV at the first step. At the second step, an interaction term (the product of the POMS sub-test score and HRT use) was entered into the equation. The equations that showed significant effects were: 'Messages Immediate' regressed on 'Depression' by 'HRT use', and 'Route Immediate' regressed on 'Tension' by 'HRT use'. The R^2 for each step and the Beta for each variable are shown in Table 17.

Table 17.
Results of Regression of RBMT-E Sub-tests on Depression and Tension Sub-scales of POMS showing B and R^2.

Variables IV	DV Route Immediate	β	*Adj.* R^2
Step1			
Tension		.16	.04
HRT		.13	
Step 2			
Tension by HRT		- .31	.07*
	DV Messages Immediate		
Step1			
Depression		.007	.01
HRT		.10	
Step 2			
Depression by HRT		-.34	.05*

*$p<.05$

'Depression' by 'HRT use' was shown to explain a further 4% of the variance in 'Messages Immediate', (R^2 change = .04, F (1, 100) = 4.7, p<.05, and 'Tension' by 'HRT use' contributed a further 3% of the variance in 'Route Immediate' (R^2 change =.03), F (1, 100) =4.02, p<.05. Table 18 below shows the means of these sub-tests.

Table 18.
Mean Scores of RBMT-E Sub-test when Regressed on Tension and Depression Sub-scales of the POMS.

	Route Immediate (DV)	
Means	HRT use	NonHRT
Tension <3 (n=50)	14.55	14.05
Tension >3 (n=45)	14.53	14.62
	Message Immediate (DV)	
Means	HRT use	non HRT
Depression <6 (n=51)	5.77	5.19
Depression >6 (n=44)	5.67	5.70

Examination of the means revealed that HRT users who had low depression scores (below a median of six), scored higher on the DV, 'Messages Immediate' than non HRT users. HRT users who had high depression scores scored lower on the DV than non HRT users.

HRT users with low tension scores (below a median of three) achieved higher scores on 'Route Immediate' than non HRT users, while HRT with high tension points, scored lower on the DV than non HRT users. The form of these interactions are illustrated as follows in Figures 2 and 3.

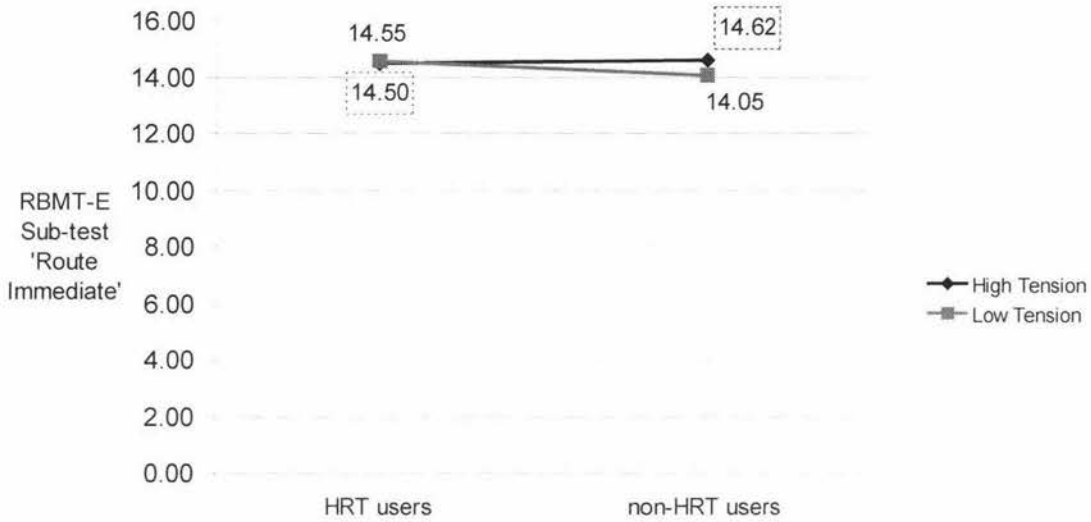

Figure 2: The form of the interaction between the 'Tension' sub-scale score of the POMS and HRT use on the 'Route Immediate' sub-test of the RBMT-E.

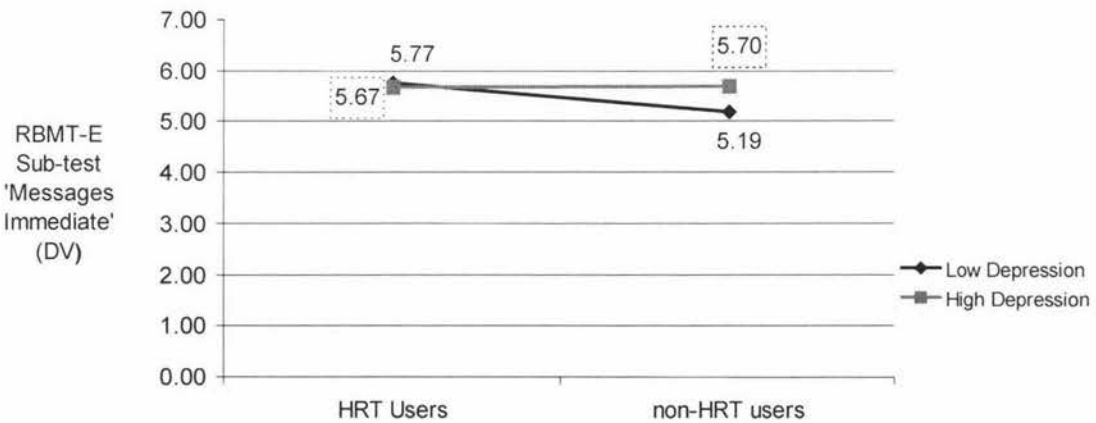

Figure 3: The form of the interaction between the 'Depression' sub-scale of POMS and HRT use on the 'Messages Immediate' sub-test of the RBMT-E.

RESULTS OF RBMT-E UTILITY ASSESSMENT

The mean scores of the RBMT-E for the present study were compared with the means obtained from the development study of this extended version of the Rivermead (Wilson et al., 1999). The sample was of a similar age (40 - 55 years) with the means reported for participants described in two age groups, below and above 50 years. For comparison with the participants in the RBMT-E development study, participants in the present study were assigned to three age groups to allow descriptions of participants below and above 50 years of age. Means and standard deviations for both samples are shown in Table 19.

Table 19.
Comparison Mean Scores with RBMT-E Development Study.

	RBMT-E (Development) Mean		RBMT-E (NZ study) Mean		
	<50yrs (n=68)	>50yrs (n=53)	<50yrs (n=30)	50-53 (n=37)	54-60 (n=37)
First Names	3.68	3.70	3.73	3.14	3.73
Second Names	3.10	2.77	2.60	2.78	2.60
Appointments/Belonging	10.13	10.45	9.27	8.51	9.51
Story I	8.77	9.24	8.13	8.32	8.41
Story D	8.07	8.16	7.40	7.57	7.73
Picture R	13.10	12.43	14.70	14.49	13.59
Face R	12.59	12.15	12.73	13.19	13.19
Route I	11.38	11.53	14.63	14.46	14.32
Route D	11.04	10.87	14.50	14.35	14.30
Messages I	5.63	5.53	5.50	5.73	5.54
Messages D	5.72	5.42	5.73	5.62	5.62
Orientation & Date	13.13	13.17	13.17	13.38	13.38

Although the development study included both genders and the present study only reports the female gender, results for all but two of the sub-tests ('Route Immediate' and 'Route Delayed') suggest similar means and the expected trend towards lower scores with increased age. The scores for 'Route Immediate' and 'Route Delayed' sub-tests were more than three raw score points than those shown for the development study.

The results from an examination of frequencies for each of the sub-tests is shown in Table 20. The numbers of participants achieving the maximum and minimum scores are expressed as percentages. A number of the sub-tests showed that a high percentage of the sample were able to achieve the maximum points allowable.

Table 20.
Frequencies of Maximum and Minimum Achievable Score for RBMT-E sub-tests.

Sub-test:	Maximum Score	Percentage: Maximum	Minimum Score	Percentage: Minimum
First Names	6	21.2	0	5.8
Second Names	6	16.3	0	20.2
Belongings	8	47.1	4	
Appointments	4	60.6	0	9.6
Picture R	20	2.9	5	1.9
Story I	15	1.0	2	1.0
Story D	15	1.9	2	4.8
Face R	15	19.2	9	3.8
Route I	15	62.5	10	1.0
Route D	15	60.6	10	1.0
Messages I	6	76.9	3	3.8
Messages D	6	78.8	3	1.9
Orientation & Date	14	48.1	11	2.9

A closer inspection of the 'Route Immediate' and 'Route Delayed' sub-tests revealed that over 83% of the participants obtained 14 out of a possible 15 points for both of these sub-tests. Similarly, in both 'Messages Immediate' and 'Messages Delayed' over 75% of participants achieved the maximum score. None of the sub-tests revealed any evidence of floor effects.

CHAPTER 7

DISCUSSION

HYPOTHESIS TESTING

The results of this study support the hypothesis that HRT users would show better everyday memory ability than non HRT users. HRT users did achieve higher scores than non HRT users on the total profile score (i.e., the overall measure of everyday memory). However, not all aspects of everyday memory as measured by the sub-tests of the Rivermead showed a significant difference between the HRT use groups. The RBMT-E sub-tests that are most generally recognised as reflecting verbal memory ability (i.e., 'Story Immediate' and 'Story Delayed'), did show significant differences between the two groups, with HRT users consistently achieving higher scores than non HRT users. This finding supported the prediction that verbal memory would show the greatest difference between the two groups. Only one other sub-test, 'Messages Delayed', showed a significant difference between the HRT use groups with HRT users scoring higher than non users. The two groups in the present study were similar in all the characteristics that were considered as possible confounds (i.e., education, mood, affect, stress and general health).

The results of this study add support to previous research that has indicated that HRT may assist to maintain, or enhance verbal memory ability in women at mid-life (Sherwin, 1988; Schmitt et al., 1996). Other studies (Yaffe et al., 1999; Resnick et al., 1998) have suggested that HRT may enhance other aspects of memory, however, the finding of a significant difference between the HRT use groups on the RBMT-E in the present study seems to reflect a strong verbal memory component.

The second hypothesis that age would be negatively related to memory ability was not supported. Although several negative correlations of age with the RBMT-E scores were indicated, none of these reached significance. Previous studies have reported chronological age exhibiting a significant influence on the RBMT scores (Wilson et al., 1989), and the RBMT-E development study (Wilson et al., 1999) showed age effects on 'Story Delayed', 'Route Immediate', Route Delayed', 'Messages Delayed' and 'Appointment and Belongings'. This may be due to discrepancies in the size of the age differences in the samples. In the present study, the size of the age difference (i.e., 40-60 years) was smaller than the RBMT-E development study (16-89 years).

Alternatively, there are also studies that have a reported a minimal relationship between RBMT scores and age, although with much older participants (Glass, 1999). It is possible that the correlations observed in the present study may have been deflated because of the restricted range of the sample (Tabachnick & Fidell, 1996). However, the absence of any significant relationship of the RBMT-E with age in the present study is supported by research that has indicated that everyday memory is relatively stable until the later decades of life (Youngjohn et al., 1993).

The hypothesis that age would exert a moderating effect on the relationship between HRT use and memory ability received limited support. Regression analysis showed that the interaction of age with HRT use explained additional variance in memory scores, in addition to that explained by age and HRT differences alone. Older women who were HRT users performed better than older women who were non-users, in memory recall for names and for remembering to do things in the future (i.e., 'Prospective Memory'). In contrast, younger women who were HRT users and performing the same memory tasks as the older women above, were found were found to perform similarly to non HRT users.

The support for a moderating effect on a relationship between HRT use and age adds to previous research which has suggested that HRT use may assist to maintain memory as age increases. Resnick et al. (1997), in an assessment of longitudinal change in memory performance, found that women who did not use HRT, showed predicted age-associated increase in memory errors, whereas HRT users maintained a stable performance over time.

In the present study the moderating effect of age is minimal (less than five percent of the total variance that may explain the dependent variable), and appears confined to a limited number of 'everyday memory' tasks. However, it is interesting to note that this age interaction effect is shown with 'Prospective Memory', an aspect of memory widely accepted as exhibiting age related changes (Craik et al., 1992; Smith et al., 1996). This adds support to the literature that suggests that HRT may protect against age associated decline (Sherwin, 1997).

The hypothesis that mood would be positively related to the memory ability received very little support. Some aspects of memory were shown to be associated with various transient mood states. For example, Face Recognition performance decreased with a higher reported mood disturbance. This is consistent with previous literature that reports impaired Face Recognition with a more depressed mood (Sweeney et al., 1989), and gives support to the hypothesis that a more negative mood would be associated with poorer memory ability. Also, several aspects of memory, including immediate and delayed verbal recall, and the memory to do tasks in the future suggest a poorer performance with an increase in mood states that reflect a more negative mood. This finding is in line with previous reports (Cohen et al., 1982), although contrary to Sweeney et al. (1982), who had found verbal learning and memory to remain at normative values in individuals who exhibited a negative or 'depressed' mood.

Altogether, although there appeared to be some relationship between memory and mood, no clear pattern emerged across the set of sub-scales or aggregated of memory to offer more support for the hypothesis.

The hypothesis that mood would moderate the effect of HRT on 'everyday memory' received limited support. A significant interaction effect of mood (i.e., 'depression' and 'tension') and HRT use was found for two 'everyday memory' tasks. However, no other mood or affect interaction effects and 'HRT use' were shown for any further everyday memory tasks.

The nature of the interaction became clear with an examination of the means of both the IV and DV. HRT users who reported high 'depression' did not perform as well as non HRT users who also reported high 'depression' for 'Messages Immediate' (i.e., remembering where to place a message). HRT users who reported low 'depression' showed a better memory ability for the same memory task than non HRT users who reported low 'depression'. In a similar manner, HRT users who had high 'tension' did not perform as well as non HRT users who also showed high 'tension' for remembering to retrace a route correctly. HRT users who had low 'tension' performed better than non HRT users who showed low 'tension' on the same task.

The results of this interaction of mood and HRT use on everyday memory ability suggests that HRT may benefit those who report mild mood disturbance, and more particularly, mild tension and depression symptoms. The results also suggest that HRT may not benefit those who report a high degree of mood disturbance in these aspects of mood. This is consistent with previous literature that has found that HRT may be of benefit to those women who report mild depression, but has no apparent effect for those women who suffer from a more serious mood disturbance (Pearlstein, 1995; Archer, 1999). It is possible that the women, who show a beneficial HRT effect on mild mood disturbance, may be those women who would show a benefit in terms of everyday memory tasks.

LIMITATIONS

The interpretation of these findings is limited by the observational design of the study. Observational studies are typically susceptible to biases and confounding factors. The women in this sample were recruited as a result of advertisement and may not be representative of the population. This may also have favoured the selection of women who had some concerns about their memory. On the other hand, responding to a newspaper advertisement may have favoured those women with good cognitive functioning. A further limitation to the interpretation of the findings was the restricted nature of the sample. The higher than average IQ of the sample limits the generalisability of the findings to the population at large.

In addition, the lack of random assignment to HRT and non HRT use groups meant that group differences may be due to unassessed confounding factors. While attempts were made to control for possible confounds (e.g., age, education, health, mood and affect), it is possible that other confounds such as socioeconomic status may have contributed to the results (Steffen et al., 1999).

Another limitation is that the study was cross-sectional. As such, data was collected on one occasion from the sample. This did not allow any assessment of participants' memory before HRT use and therefore prevents any attribution of causality to HRT.

FUTURE RESEARCH

Future studies of mid-aged women need to be randomised and longitudinal in design. This is necessary in order to provide accurate data that will establish causality and inform as to the extent of the HRT effect on memory performance. While the results of this study support a relationship of HRT with the ability to perform everyday memory tasks, the effect appears to be minimal and causality has yet to be established with confidence. Longitudinal studies would allow a baseline memory performance to be established prior to the onset of menopause and the introduction of any HRT regime.

THE UTILITY OF THE RBMT-E

The finding of such poor inter-rater reliability for the RBMT-E was unexpected. Previous reports on the original RBMT had indicated inter-rater agreement to be as high as 100% (Wilson et al., 1989). However, some recent studies that have reported on the RBMT (Fraser et al., 1999; Glass, 1999) have employed a single clinician, where inter-rater agreement has not been an issue. Furthermore, it is unclear whether inter-rater agreement for the RBMT-E has been established, as neither the pilot study undertaken for the development of the RBMT-E (de Wall et al., 1994) nor the RBMT-E manual report inter-rater findings.

One possible reason for such a surprising finding, is that the RBMT has generally been used as a clinical tool with elderly populations by experienced clinicians (de Wall et al., 1994; van Balen et al., 1996; Glass, 1999). The RBMT-E undertakes to assess the memory of a normal, and therefore a more diverse and able population. A more elaborate scoring regime for some of the sub-tests may increase the possibility of scoring discrepancies.

The RBMT-E may require more training, practice or supervision than that which was utilised in the current study. For example, testing an intelligent, highly articulate sample was quite difficult at times, especially for the 'Story Immediate' and 'Story Delayed' memory recall. Both of these sub-tests were increased in length from the RBMT. Often, the ideas or gist of the story were relayed back to the researcher at a great speed ("in an effort to get it all out before forgetting it"). As a consequence, decisions made by the raters inevitably required a degree of subjective judgment. The two researchers for this study were Masters' students, who had little previous experience of clinical testing and who were operating independently in different cities.

Another reason for the lack of rater agreement may have resulted from the proximity of the inter-rater re-testing procedure in the present study. Due to time constraints and other practicalities, some of the participants were re-tested within 24 hours. A few of these participants admitted to some confusion

especially in the 'Face' and 'Picture Recognition' memory tasks. This confusion may also have been compounded by the use of the two versions (Version 1 followed Version 2) for the inter-rater testing. Re-testing in the pilot study that was undertaken to confirm the equal difficulty of the two versions occurred one week later (de Wall et al., 1994).

Altogether, the extensions to the RBMT combined with a necessarily more complex scoring pattern and the more diverse abilities of a 'normal' population may have contributed to and compromised the inter-rater agreement in the current study. However, such a finding is not easily explained and it is believed that further exploration of inter-rater agreement in the RBMT-E may be warranted. In particular, agreement needs to exist for within and across the two versions.

A comparison of the RBMT-E development study with the present study yielded similar mean scores and approximately normal distributions for all but two of the sub-tests ('Route Immediate' and 'Route Delayed'). However, restricted ranges of two other sub-tests ('Messages Immediate' and 'Messages Delayed') also suggested the presence of ceiling effects.

In the present study 'Route Immediate' and 'Route Delayed' were three raw score points above those reported in the development study. The 'Route Immediate' and 'Route Delayed' sub-tests in the current study showed over eighty percent of the participants scoring the maximum points achievable. For 'Messages Immediate' and 'Messages Delayed', over seventy percent of participants scored within one point of the maximum score possible.

There are several considerations as to how this difference may have occurred for these particular sub-tests. In view of the scoring complexity mentioned above, discrepant scoring remains a likely contender. However, participants in the present study were mostly women who reported minimal disruption to health and were engaged in some form of employment. As such, they may not have been representative of the wider population.

In addition to the above issues of scoring and representativeness, familiarity of context may have contributed to the high scores in these sub-tests. Testing in the present study was undertaken primarily within the participants' own homes. This meant that the route as prescribed by the researcher, was introduced in well-known and familiar surroundings that may have offered helpful cues. There is some evidence to suggest that older adults may receive a disproportionate benefit to performance when the context of the memory test is a familiar one (Hess et al., 1996). For the present study, testing was nearly always conducted in the participants' homes rather than an unfamiliar testing environment.

Apart from familiarity of context, the size of some of the rooms in which testing took place may have made the task easier. Some rooms were quite small, which meant that the seven points of the route were often of necessity placed within a very short distance of each other.

These findings suggest that for this sample at least, remembering to place a message and book in the correct location as they retrace the route was not a difficult task. In addition, the presence of ceiling effects in these aspects of the memory test may have precluded the detection of small differences present between HRT users and non-users. Further investigation for these sub-tests of the RBMT-E is recommended.

The estimation of participants' IQ was necessary as some of the sub-tests had shown IQ effects in the development study (Wilson et al., 1999). The NART had been used in both the pilot study (de Wall et al., 1994), and the development study together with a further measure of verbal intelligence, Spot - the -Word sub-test from the Speed and Capacity of Language Processing Test (Baddeley, Emslie & Nimmo-Smith, 1992, cited in Wilson et al., 1999). In the present study, NART performance resulted in the number of mean errors substantially lower than the mean in the test manual and from the pilot study of the RBMT-E (de Wall et al., 1994). The test manual notes that: "in practice it is very rare for a subject to make no errors on the NART, even when IQ is in the 130 range" (Nelson et al., 1991, p.18).

The NART presented minimal challenges to very few of the women in the present study. However, this may due to the particular characteristics of the sample. Several of the women had degrees in English, and many others who had experienced very little formal education, spent time solving cross word puzzles. This resulted in an estimation of IQ for this sample which may not be representative of the population.

The restricted variance in IQ estimation that resulted was problematic, considering that the calculation of a sub-test profile score on the RBMT-E is dependent on a reasonably accurate estimation of IQ. These results suggest some caution with the use of the NART as a measure for estimating IQ for this particular population (mid-aged women). This finding also severely compromised the external validity of the current study and limited any generalisations about the effects of HRT on everyday memory in the wider population.

In the present study, no other measure of intelligence was utilised. While it is reasonable to suggest that the sample was an accurate reflection of the estimated IQs, it is possible that the ceiling effect of the NART resulted in an over estimation of IQ. If this was the case, the scoring of the RBMT-E in a clinical situation may over or underestimate a patient's memory performance.

The age effects demonstrated in the development study of the RBMT-E (Wilson et al., 1999) were not replicated in the present study. This lack of significant age effects on the RBMT-E scores, raises the question as to whether the age adjustments recommended in the manual were relevant for the present study. In addition, it suggests that age effects for the RBMT-E may not be able to be generalised to other populations with ease. This supports the observations of Fraser et al. (1999).

Part of the utility of the RBMT-E includes the classification of overall profile scores Wilson et al. (1999). This may be particularly useful in describing and identifying problems in the everyday memory of particular populations. In the

present study, eleven percent of the sample were classified as having a good memory, sixty-four percent of the sample, an average memory, and twenty-five percent of the sample were classified as having poor everyday memory ability. Because the classification calculation of the development study was based on the performance of a reasonably small sample (188 participants), further verification of the reliability of this classification will be required.

An apparent overloading of participants' working memory at the commencement of testing may be a limitation of the RBMT-E. In the present study, it was observed that many of the women were overwhelmed with the quantity of information to be retained at the start of the test. While this may be a useful discrimination of working memory capacity, the overload of information could have resulted in a failure to encode information and not reflect an accurate assessment of recall.

One of the problems that emerged in the delivery of the test was that participants could be seen actively rehearsing the 'Names' (first sub-test), while the 'Belongings' sub-test was being introduced. In addition, the position of the 'Appointments' sub-test immediately after 'Belongings' places further demand on participants' processing resources.

Glass (1999) also observed this characteristic in a study on the RBMT and elderly participants. The author has suggested this occurrence may be due to the possibility of an "overload hypothesis" (p.121), as a result of a high demand on working memory. The close proximity of the 'Appointments' and 'Belongings' sub-tests may mean that these sub-tests compete for processing resources.

It is possible that the order of the particular order of these sub-tests may have some effect as to whether the sub-tests are discriminatory in detecting difference. It may be useful to consider placing these two sub-tests further apart to confirm the "overload hypothesis" and investigate further the effect of individual sub-test position on subsequent discrimination.

It also became obvious that the quantity of information to be memorised, and retained for later recall at the start of the test, was anxiety provoking for some participants. Anxiety may have played a part in the small amount of recall that was offered by some participants. Although anxiety as a demand characteristic in relation to the RBMT has been studied, clinical experience has not indicated that anxiety is a common occurrence (Glass, 1999). However, in the present study, it was observed that on being told what they would be asked to do (as in 'Belongings' and 'Appointments'), participants frequently responded with anxious comments "I won't be able to do remember all that", and later recall ('Story Delayed', was often delivered in a hurry, "before I forget", and often included the comment; "that's it.... I can't remember any more".

The anxiety reflected in the present study may have occurred as a result of the particular self-selecting nature of the sample. Women were aware of the reason for the study, and were likely to be women who were most concerned with their memory performance. On the other hand, because of the necessity of presenting a lot of information at the start of the test (to allow for later recall), the high demand on working memory resources, may serve to heighten anxiety levels to a point that memory performance may be compromised.

The RBMT-E has the potential to be a useful instrument for establishing the baseline performance of mid-aged women's memory prior to menopause. Considering that the RBMT has proved a valid and reliable instrument for older populations (Fraser et al., 1999), the RBMT-E may be prove to be particularly useful for facilitating longitudinal assessment of memory function.

CONCLUSION

The present study offers support for a relationship between HRT use and memory performance in mid-aged women. This supports the findings of previous studies that have shown a beneficial effect of HRT use on memory in menopausal women (Sherwin, 1998). The present findings suggest that in addition to verbal memory, this positive relationship may extend to everyday memory tasks. HRT users consistently scored higher on verbal memory sub-tests of the RBMT-E, and on the overall measure of everyday memory. Older women over 52 years who were HRT users performed better on everyday memory tasks than non HRT users on the RBMT-E, adding confirmation to other studies that suggest HRT may benefit older, post-menopausal women. However, the HRT benefit did not appear to extend to younger HRT users who performed similarly to non HRT users. Although there was no clear and consistent pattern of association with mood or affect, depression and tension appeared to moderate the HRT effect on some aspects of everyday memory. The RBMT-E proved to have good face validity with this population, and apart from ceiling effects that were noted on a small number of sub-tests, is likely to become a useful tool for the assessment of everyday memory in a normal mid-aged population.

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Appendix 1

Advertisement

Memory and menopause study

Two Christchurch-based researchers are trying to determine whether hormone replacement therapy improves memory and stabilises mood in menopausal women.

Researcher Yolande Hamilton, a masters student at Massey University's School of Psychology, said a newly developed measure of memory for everyday tasks would be tested in the study.

"We are asking mid-aged women to help us to test these measures, either in their own home or at the researcher's home," Ms Hamilton said. It would involve filling in a brief questionnaire and doing some practical tests.

It would take about an hour. Ms Hamilton said the test results would remain anonymous and would be pooled. Individual identities and information would remain confidential.

The researchers want to hear from women aged 40 to 60. For more information telephone Ms Hamilton on 347-8816 or 025 877-808.

Mid-life studies

Massey University health researchers are keen to contact women aged from 40-60 years for their study of the effects of mid-life changes on women's memory and mood.

The study called Menopause, Mood and Memory is being conducted by Dr Christine Stephens and Ms Yolande Hamilton from the school of Psychology, Massey University.

Women interested in participating in the study should phone Yolande on 347-8816 or 025-877-808.

Appendix 2

Rivermead Behavioural Memory Test - Extended Version

Profile of Mood Scale

Positive and Negative Affect Scale

Women's Health Questionnaire

Short Form Health Survey (SF-36)

Life Events Questionnaire

Digit Span

North American Reading Test (NART-2).

Demographics Questionnaire

RBMT–E

Thames Valley Test Company

The Rivermead Behavioural Memory Test – Extended Version

Procedural Guide and Scoring Sheet

Subject and test details

Name

Date of birth

Date of test

Assessment ☐ First ☐ Second

Version ☐ 1 ☐ 2

Note: Before you start the test ensure you have all the appropriate equipment: test materials book and large picture card for Version 1 or 2; timer/alarm; message envelope and book; stopwatch.

1 & 2 First and Second Names

Action: Present three photographic portraits and the first and second names of the people portrayed as described in the test materials.

3 Belongings

Action: Hide two belongings as described in the test materials.

4 Appointments

Action: Demonstrate and set the timer/alarm for about 20 minutes as described in the test materials, and state questions to be asked.

5 Picture Recognition

Action: Present large picture card as described in the test materials.

6 Story (immediate)

Action: Read the story as described in the test materials, and then ask the subject to recall it.

Response: Tick each of the 21 'ideas' correctly or partially recalled.

Version 1	Correctly recalled ↓	Partially recalled (tick) ↓	Version 2
Mr Brian	☐	☐	Two hundred men
Kelly	☐	☐	at a shipyard
a Security Express employee	☐	☐	on Tyneside
was shot dead	☐	☐	went on strike
on Monday	☐	☐	this morning.
during a bank raid	☐	☐	The men walked out
in Brighton.	☐	☐	over a dispute
The four raiders	☐	☐	concerning 50
all wore masks	☐	☐	redundancies.
and one carried	☐	☐	The shop steward
a sawn-off	☐	☐	Mr Thomas
shotgun.	☐	☐	Lindsay
Police detectives	☐	☐	told reporters
were sifting through	☐	☐	'It is outrageous!
eye-witness accounts	☐	☐	The company has full order books
last night.	☐	☐	for the next two years.'
A police spokesman said	☐	☐	A management spokesperson said
'He was a very brave man.	☐	☐	'We are hoping to begin
He went for	☐	☐	fresh negotiations
the armed raider	☐	☐	at head office
and put up a hell of a fight.'	☐	☐	tomorrow.'

Raw score

☐ Each 'idea' recalled word-perfect or using a close synonym = 1

☐ Each 'idea' partially recalled or recalled with an approximate synonym = ½

☐ **Total raw score** (max = 21)

Profile score conversion table Profile score = ☐

Predicted (premorbid) intellectual band	Profile score 0	1	2	3	4
Below average	0	1	2–6	7–12	13–21
Average	0–2	3–6	7–11	12–15	16–21
Above average	0–4	5–9	10–13	14–17	18–21

5 Picture Recognition

Action: Present picture cards as described in the test materials.

Response: Record the correct identifications and the number of false positives.

Version 1		Version 2
horse	☐	elephant
clock	☐	wheel
pan	☐	trumpet
racket	☐	motorbike
book	☐	tree
camel	☐	aeroplane
drum	☐	axe
pig	☐	bottle
star	☐	cake
cup	☐	watering can
table	☐	hat
ball	☐	chair
cow	☐	dustbin
kettle	☐	apple
tortoise	☐	pram
rabbit	☐	helicopter
pipe	☐	record player
watch	☐	button
bus	☐	bicycle
bell	☐	cockerel

record false positives here ☐☐☐☐☐ ☐☐☐☐☐

Raw score

☐ Each picture correctly identified = 1

— ☐ Deduct the number of false positives

☐ **Total raw score** (max = 20)

Profile score conversion table Profile score = ☐

	Profile score 0	1	2	3	4
Raw score	0–7	8–11	12–15	16–19	20

7 Face Recognition

Action: Present faces as described in the test materials.

8 Route & 9 Messages (immediate)

Action: Demonstrate the route, leaving message envelope and book at appropriate locations, as described in the test materials. (Adapt the instructions to suit the room if appropriate, and note your route in the column headed 'Your own version' below.)

Response: Record the route taken by the subject and tick message/book boxes as appropriate.

	spontaneously	after prompt
Message picked up	☐	☐
Book picked up	☐	☐

Version 1	Version 2	Your own version	Subject's route
Chair 1	Heater	.....	
Door	Chair 1	.....	
Chair 2	Noticeboard	.....	
Message left at correct location			☐
Window	Table	.....	
Heater	Door	.....	
Table	Chair 2	.....	
Book left at correct location			☐
Noticeboard	Window	.....	

Scoring for Route

Raw score

If the route is completed correctly = 15

If the route is **not** completed correctly calculate the raw score:

☐ 1 Score 1 for each correct location visited regardless of order (max = 7)

☐ 2 Score 1 if the starting place was correct and score 1 if the finishing point was correct (max = 2)

☐ 3 Consider each location in turn together with the location following it, and score 1 if that particular pair order appears somewhere in the correct route list (max = 6)

Note: the last location in the sequence is not counted since there is no location following it.

Note also: If the **same** correct pair order occurs twice (or more) it should only be counted once.

— ☐ 4 Deduct 1 for every incorrect or repeated stage (i.e. a totally different location, or the same location visited more than once)

☐ **Total raw score** (max = 15)

Profile score conversion table Profile score =

		Profile score				
Version	Age	0	1	2	3	4
1	Below 30 years	0–10	11–12	13	14	15
	30–50 years	0–8	9–11	12–13	14	15
	51 years & over	0–3	4–9	10–13	14	15
2	Below 30 years	0–6	7–10	11–13	14	15
	30–50 years	0–7	8–10	11–13	14	15
	51 years & over	0–4	5–9	10–13	14	15

Scoring for Messages

Raw score

☐ Message picked up spontaneously = 2 / with prompt = 1

☐ Book picked up spontaneously = 2 / with prompt = 1

☐ Message left in correct location = 1

☐ Book left in correct location = 1

☐ **Total raw score** (max = 6)

Profile score conversion table Profile score =

	Profile score				
	0	1	2	3	4
Raw score	0–2	3	4	5	6

7 Face Recognition

Action: Present face cards as described in the test materials.

Response: Record the correct identifications and the number of false positives.

Version 1		Version 2
p.127	☐	p.127
p.131	☐	p.131
p.137	☐	p.137
p.139	☐	p.139
p.141	☐	p.145
p.147	☐	p.149
p.149	☐	p.155
p.157	☐	p.157
p.159	☐	p.159
p.165	☐	p.165
p.169	☐	p.167
p.171	☐	p.175
p.177	☐	p.177
p.183	☐	p.183
p.185	☐	p.185

record false positives here

☐☐☐☐☐ ☐☐☐☐☐

☐☐☐☐☐

Raw score

☐ Each picture correctly identified = 1

— ☐ Deduct the number of false positives

☐ **Total raw score** (max = 15)

Profile score conversion table Profile score =

	Profile score				
	0	1	2	3	4
Raw score	0–9	10–11	12–13	14	15

10 Orientation & 11 Date

Action: Ask the 13 questions as described in the test materials.

Response: Record the subject's responses below.

Question/response — Raw score

1 **Year** _____ ☐
1 point if correct

2 **Month** _____ ☐
1 point if correct

3 **Day** _____ ☐
1 point if correct

4 **Time** _____ ☐
1 point if within half-an-hour of correct time

5 **Date** _____ ☐
2 points if correct, 1 point if one day out

6 **Place** _____ ☐
1 point for correct name of hospital or centre, or for number of house **and** street name
0 points for 'a hospital'

7 **City/town** _____ ☐
1 point if correct (or nearest city/town if necessary)

8 **Age** _____ ☐
1 point if correct

9 **Birth year** _____ ☐
1 point if correct

10 **Prime Minister/Governor**

_____ ☐
1 point if first and second names correct
½ point for correct surname only

11 **Previous Prime Minister/Governor**

_____ ☐
1 point if first and second names correct
½ point for correct surname only

12 President

1 point if first and second names correct
½ point for correct surname only

13 Previous President

1 point if first and second names correct
½ point for correct surname only

Total raw score (max = 14)

Profile score conversion table					**Profile score =**
	Profile score				
	0	1	2	3	4
Raw score	0–10	11	12	13	14

4 Appointments

Action: Engage the subject in conversation until the alarm sounds. Prompt the subject for the two questions if not asked spontaneously.

Response

	spontaneously	after prompt
Question 1 asked	☐	☐
Question 2 asked	☐	☐

Raw score

Calculate raw score as follows:

- Each question asked spontaneously = 2
- Each question asked after prompt = 1
- Subject remembers two things had to be done but not what they were = 2
- Subject remembers one thing had to be done but not what it was = 1

Total raw score (max = 4)

Calculate profile score later: add raw score to 'Belongings' score

6 Story (delayed)

Action: Ask the subject to recall the story again as described in the test materials.

Response: Tick each of the 21 'ideas' correctly or partially recalled.

Correctly recalled ↓	Partially recalled (tick) ↓	
Version 1		**Version 2**
Mr Brian	☐ ☐	Two hundred men
Kelly	☐ ☐	at a shipyard
a Security Express employee	☐ ☐	on Tyneside
was shot dead	☐ ☐	went on strike
on Monday	☐ ☐	this morning.
during a bank raid	☐ ☐	The men walked out
in Brighton.	☐ ☐	over a dispute
The four raiders	☐ ☐	concerning 50
all wore masks	☐ ☐	redundancies.
and one carried	☐ ☐	The shop steward
a sawn-off	☐ ☐	Mr Thomas
shotgun.	☐ ☐	Lindsay
Police detectives	☐ ☐	told reporters
were sifting through	☐ ☐	'It is outrageous!
eye-witness accounts	☐ ☐	The company has full order books
last night.	☐ ☐	for the next two years.'
A police spokesman said	☐ ☐	A management spokesperson said
'He was a very brave man.	☐ ☐	'We are hoping to begin
He went for	☐ ☐	fresh negotiations
the armed raider	☐ ☐	at head office
and put up a hell of a fight.'	☐ ☐	tomorrow.'

Raw score

☐ Each 'idea' recalled word-perfect or using a close synonym = 1

☐ Each 'idea' partially recalled or recalled with an approximate synonym = ½

— ☐ Subtract 1 point if the subject needed an opening prompt

☐ **Total raw score** (max = 21)

Profile score conversion table					**Profile score =**
Predicted (premorbid) intellectual band	**Profile score** 0	1	2	3	4
Below average	0	1–2	3–6	7–10	11–21
Average	0–1	2–5	6–10	11–14	15–21
Above average	0–3	4–7	8–12	13–15	16–21

8 Route & 9 Messages (delayed)

Action: Ask the subject to take the route again as described in the test materials. (Adapt the instructions to suit the room if appropriate, and note your route in the column headed 'Your own version' below.)

Response: Record the route taken by the subject and tick message/book boxes as appropriate.

	spontaneously	after prompt
Message picked up	☐	☐
Book picked up	☐	☐

Version 1	**Version 2**	**Your own version**	**Subject's route**
Chair 1	Heater	.....	
Door	Chair 1	.....	
Chair 2	Noticeboard	.....	
Message left at correct location			☐
Window	Table	.....	
Heater	Door	.....	
Table	Chair 2	.....	
Book left at correct location			☐
Noticeboard	Window	.....	

Scoring for Route

Raw score

If the route is completed correctly = 15

If the route is **not** completed correctly calculate the raw score as follows:

☐ 1 Score 1 for each correct location visited regardless of order (max = 7)

☐ 2 Score 1 if the starting place was correct and score 1 if the finishing point was correct (max = 2)

☐ 3 Consider each location in turn together with the location following it, and score 1 if that particular pair order appears somewhere in the correct route list (max = 6)
Note: the last location in the sequence is not counted since there is no location following it.
Note also: If the **same** correct pair order occurs twice (or more) it should only be counted once.

— ☐ 4 Deduct 1 for every incorrect or repeated stage (i.e. a totally different location, or the same location visited more than once)

☐ **Total raw score** (max = 15)

Profile score conversion table Profile score =

Version	Age	Profile score 0	1	2	3	4
1	Below 30 years	0–8	9–11	12–13	14	15
	30–50 years	0–6	7–10	11–13	14	15
	51 years & over	0–6	7–9	10–12	13	14–15
2	Below 30 years	0–3	4–10	11–13	14	15
	30–50 years	0–3	4–9	10–13	14	15
	51 years & over	0–6	7–9	10–11	12–13	14–15

Scoring for Messages

Raw score

☐ Message picked up spontaneously = 2 / with prompt = 1

☐ Book picked up spontaneously = 2 / with prompt = 1

☐ Message left in correct location = 1

☐ Book left in correct location = 1

☐ **Total raw score** (max = 6)

Profile score conversion table Profile score =

	Profile score 0	1	2	3	4
Raw score	0–2	3	4	5	6

1 & 2 First and Second Names

Action: Re-present the three photographic portraits and ask for the names of the people portrayed as described in the test materials.

Response

	spontaneously	after prompt
Portrait 1		
First name recalled	☐	☐
Second name recalled	☐	☐
Portrait 2		
First name recalled	☐	☐
Second name recalled	☐	☐
Portrait 3		
First name recalled	☐	☐
Second name recalled	☐	☐

Scoring for First Names

Raw score

Calculate raw score as follows:

- Each first name recalled spontaneously = 2
- Each first name recalled after prompt = 1

☐ **Total raw score** (max = 6)

Profile score conversion table Profile score =

Predicted (premorbid) intellectual band	Profile score 0	1	2	3	4
Below average	0	1	2–3	4	5–6
Average	0	1–2	3–4	5	6
Above average	0–1	2–3	4	5	6

Scoring for Second Names

Raw score

Calculate raw score as follows:

- Each second name recalled spontaneously = 2
- Each second name recalled after prompt = 1

☐ **Total raw score** (max = 6)

Profile score conversion table Profile score =

Version	Predicted (premorbid) intellectual band	Profile score 0	1	2	3	4
1	Below average	0	1	2–3	4	5–6
	Average & above average	0–1	2	3–4	5	6
2	Below average	0	1	2–3	4–5	6
	Average & above average	0	1	2–4	5	6

3 Belongings

Action: Pause/prompt the subject for the hidden belongings as described in the test materials.

Response

	spontaneously	after prompt
Belonging 1 recalled	☐	☐
Belonging 2 recalled	☐	☐
Location 1 recalled	☐	☐
Location 2 recalled	☐	☐

Raw score

Calculate raw score as follows:

- Each belonging recalled spontaneously = 2
- Each belonging recalled after prompt = 1
- Each location recalled spontaneously = 2
- Each location recalled after prompt = 1

☐ **Total raw score** (max = 8)

Profile score conversion table Profile score =

Note: Add 'Appointments' raw score (p.3) to 'Belongings' raw score (max = 12) to obtain one combined profile score

	Profile score 0	1	2	3	4
Combined raw score	0–8	9	10	11	12

Score summary

	Raw score		Profile score
1 First Names	☐		☐
2 Second Names	☐		☐
3 Belongings	☐	+	☐
4 Appointments	☐		
5 Picture Recognition	☐		☐
6 Story (immediate)	☐		☐
6 Story (delayed)	☐		☐
7 Face Recognition	☐		☐
8 Route (immediate)	☐		☐
8 Route (delayed)	☐		☐
9 Messages (immediate)	☐		☐
9 Messages (delayed)	☐		☐
10 & 11 Orientation and Date	☐		☐
Totals	☐		☐
	max = 157		max = 48

Below is a list of words that describe feelings people have. Please read each one carefully. Then choose **ONE** number from the following five point scale which best describes **how you have been feeling during the past week including today** and write it beside the word:

Not at all 0	A little 1	Moderately 2	Quite a bit 3	Extremely 4

Friendly	_____	Unworthy	_____	Desperate	_____
Tense	_____	Spiteful	_____	Sluggish	_____
Angry	_____	Sympathetic	_____	Rebellious	_____
Worn out	_____	Uneasy	_____	Helpless	_____
Unhappy	_____	Restless	_____	Weary	_____
Clear-headed	_____	Unable to concentrate	_____	Bewildered	_____
Lively	_____	Fatigued	_____	Alert	_____
Confused	_____	Helpful	_____	Deceived	_____
Sorry for things done	_____	Annoyed	_____	Furious	_____
Shaky	_____	Discouraged	_____	Efficient	_____
Listless	_____	Resentful	_____	Trusting	_____
Peeved	_____	Nervous	_____	Full of pep	_____
Considerate	_____	Lonely	_____	Bad-tempered	_____
Sad	_____	Miserable	_____	Worthless	_____
Active	_____	Muddled	_____	Forgetful	_____
On edge	_____	Cheerful	_____	Carefree	_____
Grouchy	_____	Bitter	_____	Terrified	_____
Blue	_____	Exhausted	_____	Guilty	_____
Energetic	_____	Anxious	_____	Vigorous	_____
Panicky	_____	Ready to fight	_____	Uncertain about things	_____
Hopeless	_____	Good natured	_____	Bushed	_____
Relaxed	_____	Gloomy	_____		

PLEASE MAKE SURE YOU HAVE ANSWERED EVERY ITEM.

Feelings Assessment Scale

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate number in the space next to that word. Use the following scale to record your answers:

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

Please indicate to what extent you have felt this way during the past week.

_____interested

_____distressed

_____excited

_____upset

_____strong

_____guilty

_____scared

_____hostile

_____enthusiastic

_____proud

_____irritable

_____alert

_____ashamed

_____inspired

_____nervous

_____determined

_____attentive

_____jittery

_____active

_____afraid

Women's Health Questionnaire

Please indicate **how you have been feeling during the past week including today** by choosing a number from the following four point scale to write beside the statement:

No, not at all	**No, not much**	**Yes, sometimes**	**Yes, definitely**
0	**1**	**2**	**3**

____ I wake early then sleep badly for the rest of the night.

____ I am restless and can't keep still.

____ I have headaches.

____ I feel more tired than usual.

____ I have dizzy spells.

____ My breasts feel tender or uncomfortable.

____ I suffer from backache/or pains in my limbs.

____ I have hot flushes.

____ I am more clumsy than usual.

____ I have abdominal cramps or discomfort.

____ I feel sick or nauseous.

____ I have lost interest in sexual activity.

Turn over to page 2. ...

Women's Health Questionnaire

Please indicate **how you have been feeling during the past week including today** by choosing a number from the following four point scale to write beside the statement:

No, not at all	**No, not much**	**Yes, sometimes**	**Yes, definitely**
0	**1**	**2**	**3**

____ I have heavy periods.

____ I suffer from night sweats.

____ My stomach feels bloated.

____ I have difficulty in getting off to sleep.

____ I often notice pins and needles in my hands and feet.

____ I have difficulty in concentrating.

____ As a result of vaginal dryness sexual intercourse has become uncomfortable (please omit if not sexually active).

____ I need to pass urine/water more frequently than usual.

____ My memory is poor.

____ I have practical problems such as managing money or keeping appointments.

____ Any other problems. Please explain what these are:

_____

_____

SF-36 HEALTH SURVEY

INSTRUCTIONS: This questionnaire asks for your views about your health, how you feel and how well you are able to do your usual activities.

Answer every question by marking the answer as indicated. If you are unsure about how to answer a question, please give the best answer you can.

1. In general, would you say your health is:

(circle one)

Excellent 1

Very good 2

Good 3

Fair 4

Poor 5

2. Compared to one year ago, how would you rate your health in general now?

(circle one)

Much better now than one year ago 1

Somewhat better now than one year ago 2

About the same as one year ago 3

Somewhat worse now than one year ago 4

Much worse now than one year ago 5

3. The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

(circle one number on each line)

ACTIVITIES	Yes, Limited A Lot	Yes, Limited A Little	No, Not Limited At All
a. **Vigorous activities**, such as running, lifting heavy objects, participating in strenuous sports	1	2	3
b. **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	1	2	3
c. Lifting or carrying groceries	1	2	3
d. Climbing **several** flights of stairs	1	2	3
e. Climbing **one** flight of stairs	1	2	3
f. Bending, kneeling or stooping	1	2	3
g. Walking **more than one kilometre**	1	2	3
h. Walking **half a kilometre**	1	2	3
i. Walking **100 metres**	1	2	3
j. Bathing or dressing yourself	1	2	3

4. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

(circle one number on each line)

	YES	NO
a. Cut down on the **amount of time** you spent on work or other activities	1	2
b. **Accomplished less** than you would like	1	2
c. Were limited in the **kind** of work or other activities	1	2
d. Had **difficulty** performing the work or other activities (for example, it took extra effort)	1	2

(IQOLA SF-36 Standard Australia/New Zealand Version 1.0 - 7/94)

5. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

(circle one number on each line)

	YES	NO
a. Cut down on the **amount of time** you spent on work or other activities	1	2
b. **Accomplished less** than you would like	1	2
c. Didn't do work or other activities as **carefully** as usual	1	2

6. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours, or groups?

(circle one)

Not at all 1

Slightly 2

Moderately 3

Quite a bit 4

Extremely 5

7. How much bodily pain have you had during the past 4 weeks?

(circle one)

No bodily pain 1

Very mild 2

Mild 3

Moderate 4

Severe 5

Very severe 6

8. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

(circle one)

Not at all 1

A little bit 2

Moderately 3

Quite a bit 4

Extremely 5

9. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks -

(circle one number on each line)

	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	None of the Time
a. Did you feel full of life?	1	2	3	4	5	6
b. Have you been a very nervous person?	1	2	3	4	5	6
c. Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
d. Have you felt calm and peaceful?	1	2	3	4	5	6
e. Did you have a lot of energy?	1	2	3	4	5	6
f. Have you felt down?	1	2	3	4	5	6
g. Did you feel worn out?	1	2	3	4	5	6
h. Have you been a happy person?	1	2	3	4	5	6
i. Did you feel tired?	1	2	3	4	5	6

10. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?

(circle one)

All of the time 1

Most of the time 2

Some of the time 3

A little of the time 4

None of the time 5

11. How TRUE or FALSE is each of the following statements for you?

(circle one number on each line)

	Definitely True	Mostly True	Don't Know	Mostly False	Definitely False
a. I seem to get sick a little easier than other people	1	2	3	4	5
b. I am as healthy as anybody I know	1	2	3	4	5
c. I expect my health to get worse	1	2	3	4	5
d. My health is excellent	1	2	3	4	5

Readjustment Rating Scale

Please check beside any of the following events that have affected you in the last 12 months (tick all that apply).

Life Event	Life Event
____ Death of spouse	____ Son or daughter leaving home
____ Divorce	____ Trouble with in-laws
____ Marital separation	____ Outstanding personal achievement
____ Jail term	____ Partner begin or stop work
____ Death of close family member	____ Begin or end school
____ Personal injury or illness	____ Change in living conditions
____ Marriage	____ Revision of personal habits
____ Fired at work	____ Trouble with boss
____ Marital reconciliation	____ Change in work hours or conditions
____ Retirement	____ Change in residence
____ Change in health of family member	____ Change in schools
____ Pregnancy	____ Change in recreation
____ Sex difficulties	____ Change in church activities
____ Gain of new family member	____ Change in social actiivities
____ Business readjustment	____ Mortgage or loan less than $10,000
____ Change in financial state	____ Change in sleeping habits
____ Death of close friend	____ Change in number of family get-togethers
____ Change to different line of work	____ Change in eating habits
____ Change in number of arguments with spouse	____ Vacation
____ Mortgage over $10,000	____ Christmas
____ Foreclosure of mortgage or loan	____ Minor violations of the law
____ Change in responsibilities at work	

11. Digit Span (Optional)

DISCONTINUE RULE:
After scores of 0 on both trials of any item.
For both Digits Forward & Backward, administer both trials of each item even if Trial 1 is passed.

RECORDING:
All responses verbatim

SCORING RULE:
0=1 pt. for each response

Digits Forward

Item/Trial		Response	Score 0 or 1
1.	Trial 1	1 – 7	
	Trial 2	6 – 3	
2.	Trial 1	5 – 8 – 2	
	Trial 2	6 – 9 – 4	
3.	Trial 1	6 – 4 – 3 – 9	
	Trial 2	7 – 2 – 8 – 6	
4.	Trial 1	4 – 2 – 7 – 3 – 1	
	Trial 2	7 – 5 – 8 – 3 – 6	
5.	Trial 1	6 – 1 – 9 – 4 – 7 – 3	
	Trial 2	3 – 9 – 2 – 4 – 8 – 7	
6.	Trial 1	5 – 9 – 1 – 7 – 4 – 2 – 8	
	Trial 2	4 – 1 – 7 – 9 – 3 – 8 – 6	
7.	Trial 1	5 – 8 – 1 – 9 – 2 – 6 – 4 – 7	
	Trial 2	3 – 8 – 2 – 9 – 5 – 1 – 7 – 4	
8.	Trial 1	2 – 7 – 5 – 8 – 6 – 2 – 5 – 8 – 4	
	Trial 2	7 – 1 – 3 – 9 – 4 – 2 – 5 – 6 – 8	

Forward Total Score
Range = 0 to 16 ____

Digits Backward

Item/Trial		(Correct Response)/Response	Score 0 or 1
1.	Trial 1	2 – 4 (4 – 2)	
	Trial 2	5 – 7 (7 – 5)	
2.	Trial 1	6 – 2 – 9 (9 – 2 – 6)	
	Trial 2	4 – 1 – 5 (5 – 1 – 4)	
3.	Trial 1	3 – 2 – 7 – 9 (9 – 7 – 2 – 3)	
	Trial 2	4 – 9 – 6 – 8 (8 – 6 – 9 – 4)	
4.	Trial 1	1 – 5 – 2 – 8 – 6 (6 – 8 – 2 – 5 – 1)	
	Trial 2	6 – 1 – 8 – 4 – 3 (3 – 4 – 8 – 1 – 6)	
5.	Trial 1	5 – 3 – 9 – 4 – 1 – 8 (8 – 1 – 4 – 9 – 3 – 5)	
	Trial 2	7 – 2 – 4 – 8 – 5 – 6 (6 – 5 – 8 – 4 – 2 – 7)	
6.	Trial 1	8 – 1 – 2 – 9 – 3 – 6 – 5 (5 – 6 – 3 – 9 – 2 – 1 – 8)	
	Trial 2	4 – 7 – 3 – 9 – 1 – 2 – 8 (8 – 2 – 1 – 9 – 3 – 7 – 4)	
7.	Trial 1	9 – 4 – 3 – 7 – 6 – 2 – 5 – 8 (8 – 5 – 2 – 6 – 7 – 3 – 4 – 9)	
	Trial 2	7 – 2 – 8 – 1 – 9 – 6 – 5 – 3 (3 – 5 – 6 – 9 – 1 – 8 – 2 – 7)	

Backward Total Score
Range = 0 to 14 ____

Total Score
Range = 0 to 30 ____

(Sum Forward Total Score & Backward Total Score)

DEMOGRAPHICS

MY AGE IN YEARS: _____

MY ETHNIC BACKGROUND IS (please tick one):

- ___ New Zealand European
- ___ New Zealand Maori
- ___ Pacific Islander
- ___ Asian
- ___ Other (please specify): _____

HOW MUCH SCHOOLING HAVE YOU HAD? (please tick one):

- ___ no school qualification
- ___ school certificate passed in one or more subjects
- ___ sixth form certificate
- ___ university bursary or scholarship
- ___ trade or professional certificate or diploma
- ___ university undergraduate degree or diploma
- ___ postgraduate qualification
- ___ Other (please specify): _____

WHAT IS YOUR PRIMARY EMPLOYMENT STATUS? (please tick ONE):

- ___ full-time paid work
- ___ part-time paid work
- ___ full-time unpaid work
- ___ retired or permanently unable to work
- ___ Other (please specify): _____

DO YOU ENGAGE IN MODERATE EXERCISE FOR AT LEAST 30 MINUTES, AT LEAST 3 TIMES PER WEEK?

- ___ yes
- ___ no

ARE YOU RIGHT-HANDED OR LEFT-HANDED?

- ___ right-handed
- ___ left-handed
- ___ ambidextrous

HAVE YOU EVER BEEN KNOCKED UNCONSCIOUS OR CONCUSSED?

- ___ yes
- ___ no

DO YOU HAVE A FAMILY HISTORY OF NEUROLOGICAL CONDITIONS SUCH AS (check all that apply):

- ___ strokes or TIA's
- ___ Alzheimer's Disease
- ___ another type of dementia
- ___ none

DO YOU HAVE A HISTORY OF SMOKING (check all that apply):

___ cigarette smoking (past)
___ cigarette smoking (present)

DO YOU HAVE A HISTORY OF ONE OF THE FOLLOWING (check all that apply):

___ diabetes
___ high blood pressure
___ heart disease
___ epilepsy
___ cancer
___ depression
___ pre-menstrual tension or symptoms

HAVE YOU HAD A HYSTERECTOMY (tick all that apply)?

___ no hysterectomy or ovarian surgery
___ removal of ONE ovary
___ removal of BOTH ovaries
___ removal of uterus

IF YOU HAVE NOT HAD A HYSTERECTOMY OR ANY OVARIAN SURGERY, HAS IT BEEN 12 MONTHS OR MORE SINCE YOUR LAST MENSTRUAL PERIOD?

___ yes
___ no

HOW WOULD YOU DESCRIBE YOURSELF?

___ pre-menopausal
___ menopausal
___ post-menopausal

ARE YOU CURRENTLY TAKING ANY HORMONE REPLACEMENT MEDICATION, FROM YOUR DOCTOR, CHEMIST OR HEALTH STORE? (please list)

_____
_____
_____
_____
_____
_____

WHAT OTHER MEDICATIONS ARE YOU CURRENTLY TAKING, EITHER PRESCRIBED OR REGULARLY TAKEN OVER-THE-COUNTER PREPARATIONS (other than HRT)?

_____
_____
_____
_____
_____
_____

Appendix 3

Information Sheet

Consent Form

Massey University
COLLEGE OF HUMANITIES & SOCIAL SCIENCES

School of Psychology
Private Bag 11 222,
Palmerston North,
New Zealand
Telephone: 64 6 356 9099
Facsimile: 64 6 350 5673

Menopause, Mood and Memory Study

March 10, 2000

Thank you your interest in this study. The researchers are Dr Christine Stephens and Ms Yolande Hamilton from the School of Psychology at Massey University. You can contact the researchers, to ask about the study, by writing to any of us at the address above, or by telephoning us on:
03 347 8816 or 025 877 808.

What is the study about?

There is some evidence that hormone changes at mid-life affect women's memory and mood. The purpose of the study is to understand more about these effects by using a newly developed measure of memory for everyday tasks.

What will participants do?

We are asking mid-aged women to help us to test these measures, either in their own home or at the researcher's home. A researcher will meet with you individually and ask you to take some practical tests, as well as fill in a brief questionnaire. This should take about 45-60 minutes.

What will happen to the information?

The results of the tests will be completely anonymous and will be pooled together, so that we can see if any particular parts of the test battery are causing difficulty to our participants. No names will be linked to the results and no individual results will be studied or reported. The aggregated results may be published in professional journals. We will send a brief report of the initial results to every participant who is interested. When we have completed the research, the results from this study will be destroyed. The contact information that we receive (names and addresses) will be completely confidential to the researchers, and will also be destroyed at this point.

Am I eligible to take part?

If you wish to take part in the study you should be aged between 40 and 60 years (inclusive). We will be very interested to hear from any woman in this age group.

Summary of your rights

If you choose to participate in the study you have the right to:

- Receive information about the results at the conclusion of the study.
- Contact the researchers at any time during the study
- Participate in the study anonymously and with confidence that your personal details are confidential
- Decline to take part or withdraw from the study at any time.

Consent Form

I have read the information sheet and had the details of the study explained to me. My questions have been answered to my satisfaction and I understand that I may ask further questions at any time.

I understand that I have the right to withdraw from the study at any time and to decline to answer any particular questions.

I agree to provide information to the researchers on the understanding that my name will not be connected with any information from interviews or discussions. The information will be used only for this research and publications arising from this research project.

I agree to participate in this study under the conditions set out in the information sheet.

Signed: .....

Name .....

Date .....