Memory and ageing

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Summary

Part 1: Memory beliefs and performance

Memory beliefs (Chapter 1)

If we want to learn about older adults' everyday memory, both subjective beliefs about memory (Chapter 1) and memory performance (Chapter 2) need to be studied. Although recently there has been an upsurge in interest in memory beliefs, this has not yielded clear conclusions about how older adults see their own memory. We assumed that subjective memory beliefs and judgements are a combination of reconstructive processes of episodic memory experiences and general beliefs or stereotyped expectations about memory. Moreover, we hypothesised that answers to memory questionnaires may vary strongly according to the standard of comparison the subject chooses. To investigate this hypothesis a questionnaire was developed in which older adults (N= 117, 46-89 years) had to compare their memory to that of age peers, 25-year-old young adults, and their own performance at the age of 25. In line with social comparison theory, that says that people generally assess their capacities as superior to those of others, most participants were very positive about their memory compared to age peers. Most subjects even believed their memories to be better than that of young adults. When they compared their present to their past memory functioning, however, a decline was reported. To our surprise, only about half of the subjects expected future memory decline. These results imply that older adults believe their memory used to be excellent in their younger days and despite a decline still functions quite well. Because the vast majority thought their memory was better than or equal to that of young adults, it can also be implied that they believe that the memories of present generations of young adults are worse than those of previous generations. Contrary to prevailing stereotypes, this latter explanation may be interpreted as a negative stereotype of *young* people's memory. Against common stereotypes was also the finding that all types of memory judgements were only weakly related to age.

The results show that memory self-reports are strongly influenced by the standard

against which subjects compare themselves. As long as they may choose this standard, ambiguous data is unavoidable. When using self-reports in research and in clinical practice it is thus important to realise that subjective judgements are rather useless unless participants are given a specific standard against which to evaluate their own functioning.

Memory performance (Chapter 2)

A general finding with regard to objective memory performance is that older adults, on average, perform worse than young adults on most kinds of declarative memory tests. It is sometimes questioned, however, whether these results (which are mostly obtained with abstract, artificial stimuli) generalise to memory functioning in daily life. In daily life, older adults do not need to remember unrelated or nonsense words, but remembering concerns for example names, conversations, or intended actions. Possibly, age effects in memory performance are smaller if test materials are used that show a stronger resemblance to the things one has to remember in daily life, so-called ecological memory tests. This chapter aimed to assess the strength of age effects on both standard laboratory and ecological memory tests and the psychometric qualities of these tests. Memory performance was assessed in an unselected group of older adults (mean age 62 years, range 46-89) and a group of older adults having memory complaints who applied for memory training (mean age 63 years, range 45-85). The latter group is a relevant one for clinical practice, since healthy subjects who consider themselves forgetful are often seen in memory clinics.

Clear age effects were found on most memory tests, also after correction for education. The results show that the age effects on standard laboratory tests cannot be assigned to the use of meaningless material, because also on ecological memory tests age differences were found. To our surprise, performance of the subject group who was on the waiting list for memory training was on average better than the a-select recruited subjects. This is again an illustration of the rather general finding that memory complaints and performance do not necessarily agree (see also Chapter 4). One implication is that in the first group higher performance thresholds should be employed in assessing whether memory performance is deviant.

Test-retest reliabilities of the ecological memory tests did not differ systematically from those of standard laboratory tests. However, not all tests showed satisfactory retest reliabilities, which was even true for tests often used in clinical settings. For tests with retest reliabilities above r= .65 norms corrected for age and educational level were provided for clinical practice.

The influence of suboptimal health on memory performance (Chapter 3)

Besides the use of meaningless laboratory tests, another explanation that is often proposed for age effects on memory performance is the influence of age-correlated health factors. It is

obvious that significant levels of brain pathology are associated with impaired cognitive function. The issue, however, is the extent to which biological risk factors in assumed healthy subjects may contribute to age differences in performance on memory tests. According to the theory of brain reserve, it might be expected that the relationships between health indicators and memory performance are stronger in the older than the younger subjects in our sample.

The presence of 9 categories of biological life events (BLE): consultation of a neurologist, systemic diseases, repeated mild concussions, repeated anaesthesia, use of psychotropic medication, alcohol use, other neurotoxic factors such as exposure to organic solvents, psychiatric disorders, birth complications or developmental problems was assessed in our two subject groups: an unselected group of older adults (mean age 62 years, range 46-89) and a group of older adults having memory complaints who applied for memory training (mean age 63 years, range 45-85).

Memory performance was assessed with a battery covering different aspects of memory. Since it is sometimes argued that subjective memory complaints are an early indicator of cognitive decline, prior to the detection of problems on neuropsychological tests, the possible effects of the health-related incidents were not only assessed on memory test performance, but also on subjective memory complaints. The subtle effects of health-related incidents may become visible only on subjective evaluations of cognitive functioning. Memory self-ratings were assessed with questionnaires asking for frequencies of memory failures and a general judgement of memory capacity.

Health-related incidents occurred in about half of both subject groups. The most frequently reported BLE in both groups was anaesthesia. Contrary to the expectations, neither the presence nor the number of health-related incidents was significantly related to memory performance. Moreover, there was no interaction with age. This means that these health incidents did not negatively influence memory performance and the effects of these incidents on memory performance were not larger in the oldest subjects. Furthermore, it has not been found to be true that the effects of the health-related incidents were revealed by more subtle variables, viz. through subjective memory complaints. Furthermore, it appeared that the presence and effects of BLE did not differ between the normal and clinical group elderly. The results do not agree with the notion that health-related indices are a major factor in the explanation of age differences in memory performance and memory complaints of normal ageing subjects.

The relation between memory beliefs and memory performance (Chapter 4)

An obvious question that raises after the study of memory beliefs and memory performance is about the relation between both aspects. With common sense, one would expect the age differences in memory functioning that are found on a broad array of tests to parallel a

perceived decline in everyday memory as experienced subjectively. However, memory self-reports are generally found to be not or only marginally related to memory performance. In Chapter 4, several possible explanations for the weak relations between subjective memory judgements and objective memory performance were investigated in our two groups of normal older adults.

Relations between memory self-reports and performance were weak in both groups and for all kinds of tests. Against all expectations, the low correlations could not be explained by differences between ecological and laboratory tests, because correlations with ecological memory tests (like remembering a short story) and with incidental memory tests were not weaker than the ones with standard laboratory tests (like remembering unrelated words). Furthermore, when subjective and objective measures assessed the same ability, like remembering names, correlations remained low and generally insignificant. The same was true when subjects had to give a performance rating after having performed the tests. This suggests that the episodic information of test performance is not used adequately in the memory judgements.

Another possible explanation for the weak relations between memory self-evaluations and memory performance was that memory self-reports may be coloured by individual differences in variables like mood or life style. When the effects of mood and lifestyle were controlled for it showed that these variables hardly influenced the relation between self-reports and test performance.

It was expected that relations between memory judgements and memory performance would be stronger in the subject group presenting memory complaints than in the a-select sample, because the first group may be more conscious about their own memory functioning. However, correlations were comparable for both subject groups. Furthermore, differences in the relations between subjective and objective memory might be expected as a function of age. In our society negative stereotypes prevail about memory in old age. Especially the oldest age groups may have internalised these stereotypes. However, the (weak) relations between subjective and objective memory measures were comparable for subjects over and under 65 years of age.

The results confirm that self-reports are no reliable indicators of memory performance. The only conclusion that remains is that subjective and objective memory may actually be different things that should not even be expected to be systematically related. Subjective evaluations are sensitive to all kinds of distortions related to introspection, such as the memory paradox (the poorer one's memory, the more likely that memory failures will be forgotten) and illusory superiority (subjects are inclined to believe that their memory is better than others' memory). Moreover, self-reports may be mere rationalisations instead of an inventarisation of episodic memory experiences; they may be influenced by implicit individual theories and by a lack of knowledge about memory performance of other people.

Retest effects in memory performance (Chapter 5)

Chapter 5 addresses a methodological issue that is not only scientifically, but also clinically relevant, viz. the presence of retest improvements in objective test performance after repeated testing. In clinical settings, patients often have to be tested repeatedly, for example, in order to assess the spontaneous recovery after acquired brain damage or the cognitive deterioration in degenerative disorders. Diagnoses and decisions about treatment are strongly influenced by decreases or increases in cognitive functioning. Performance improvements, however, may result from repeated testing. Little knowledge exists about the causes and circumstances under which retest gains do or do not occur.

In this chapter, several possible explanations for the presence of retest effects in our two groups of normal older adults were tested. In general, repeated testing appeared to lead to improvements in memory performance, even with an inter-test interval as long as three months. This rather long retest interval is comparable to follow-up appointments in clinical practice.

Although in clinical settings parallel test versions are often used in the belief to eliminate retest effects, performance improvements were found on both identical and parallel test conditions. The presence of retest gains suggests some functioning of memory.
Theoretically, the presence of retest gains on both identical and parallel test versions implies that the gains cannot be explained from explicit memory processes, e.g. from remembering items or solutions from a previous test occasion. This means that retest gains may be related to non-declarative, procedural learning effects as subjects learn how to approach the test. The absence of age differences in retest effects is another argument for the suggestion that retest gains may be related to procedural learning, and may be related to the relative insensitivity of procedural learning to the effects of ageing. If retest gains were due to episodic remembering, they would expected to be smaller for older adults.

It is sometimes assumed that retest gains may result from the fact that subjects get accustomed to the test situation and as a consequence are less anxious. If this was true, improvements would be expected to be correlated over tests, which was not confirmed by our results. The absence of inter-correlations between retest gains thus suggests that retest improvements are not an individual characteristic. Norms for retest improvements are thus essential.

An important implication for clinical practice of these findings is that one needs to be very careful in making diagnoses or decisions about treatment on the basis of performance improvements assessed in repeated evaluations.

Use of compensatory strategies (Chapter 6)

An important characteristic of memory in daily life is the ability to use compensatory strategies. One of the reasons why self-reported memory may not correspond to memory performance as assessed by tests may be the fact that daily life gives many more opportunities to employ compensatory strategies: one can take more time to encode the information, write things down, etcetera. In Chapter 6 it was studied whether older adults use these compensatory possibilities. From the literature it may be predicted that with increasing age, an increase in external compensation strategies (e.g., diary or notes) will be found, and a decrease in internal compensation strategies such as association, and organisation of memory.

The frequency and preference of memory strategies was investigated in our group of older adults who applied for memory training. While most previous studies have been confined to only one strategy measure, or at best distinguished between internal and external strategies, it was investigated whether a further differentiation between categories of memory strategies could be demonstrated. Mokken scale analysis identified, besides the use of 'no strategy', four uni-dimensional strategy scales, viz. encoding, retrieval, general, and external strategies. These five scales allowed for a differentiated analysis of strategy use.

The frequency of strategy use was not very high, ranging between "sometimes" and "regularly". Frequency judgements showed that external strategies were used most frequently, followed by retrieval strategies. Encoding strategies were used least. Within our subject group, strategy reports were not correlated with age, and only weakly with educational level and sex. More frequently reported use of retrieval strategies was associated with higher educated subjects, and more frequent use of general strategies was reported by men. Contrary to what could be expected from the literature, there was no indication for an increase in the reported use of external strategies with age, or a decrease in encoding strategies. Strategy reports were more related to psychological variables (mental speed, primary memory capacity, need for cognition and memory complaints) than to demographic characteristics (age, educational level and sex). The explained variances, however, were low which suggests important individual differences in memory strategy use.

Not only subject-related variables influence strategy choice and use. Strategy use seems to be also situation-specific. For example, external strategies seem to be more apt for the remembering of actions to be performed in the future (prospective remembering), while internal strategies are thought to be better suited for retrospective remembering. Reports on the preference of strategies in specific situations showed that subjects indeed reported to use specific strategies: in names encoding situations, encoding strategies were reported most, and in names retrieval situations retrieval strategies. For remembering intentions, subjects mostly relied on external strategies. Still, external strategies were used most generally over situations.

The conclusion is that, although there is some differential use of specific strategies in specific memory situations, our subjects generally trusted on external strategies. In some

situations, however, internal strategies may be preferable. A possible explanation for the fact that internal strategies were seldom reported is that older adults lack sufficient knowledge about the applicability and effectiveness of different strategies in different situations. This indicates that strategy training may be a useful method for improving memory performance in older adults.

Part 2: Effects of memory interventions

Issues with regard to the treatment of memory problems (Chapter 7)

The practical and methodological concerns that need to be addressed in the design and evaluation of a memory training programme are described in Chapter 7. General issues with regard to the development of memory training programmes are described in this chapter, while the results of the interventions are described in Chapters 8 through 12.

The aims and methods of a memory intervention are largely determined by the subject (group). In selecting subjects, it should first be assessed whether the reported memory problems are indeed caused by a disturbed memory function, since memory complaints and test performance are generally not or only slightly related. A thorough neuropsychological evaluation is required to assess the presence, nature and severity of a memory deficit.

Several methods of memory treatment exist. Psycho-education is directed at giving insight in the individual's memory functioning and providing information about memory functioning and ageing. Especially in middle-aged persons, memory complaints may be related to stress or depressive mood. Normal age-related memory decline may also give cause to worries about memory functioning. In these cases, treatment may be focussed on providing information about memory and thereby reducing worries and anxiety.

If the treatment aims to improve performance on one specific task only, prolonged practice and rehearsal of this task can be a suitable method. In the present thesis performance improvements were aimed to be domain-specific, which means that not only the task practised is remembered better, but also new similar tasks. This was reached by teaching cognitive strategies, which are mental aids that facilitate encoding and/or retrieval of information. The underlying principle of cognitive strategies is compensation: the patient is enabled to perform better by using more conscious or efficient methods. Learning memory strategies is especially suited for patients with relatively isolated memory disturbances who have little or no other cognitive disorders, such as older adults.

In clinical practice, memory interventions are seldom properly evaluated, which makes it hard to demonstrate unambiguously that the effect of training is due to the treatment used. Performance improvements may be a result of the positive attention received from the therapist. Furthermore, it has been shown in Chapter 5 that repeated administration of the same or parallel tests may lead to learning effects. In the present thesis, a control group was included to assess whether performance improvements are larger than retest effects.

Another important question concerns the generalisability of the results. The practical utility of a memory training is especially determined by its long-term effects. The evaluation was thus not confined to a pre- and post-test, but also included a follow-up measurement after three months. A further question concerns to what extent the effect of training generalises to other tasks. A domain-specific training should show generalisation to memory problems similar to the task taught. Generalisation to other kinds of memory tasks is also assessed, since performance on tasks on which theoretically absolutely no effect of training is expected (such as reaction times) may give strong hints for the specificity of the training effect. If the speed of information processing has increased after training, performance improvements on memory tests may not result from the specific intervention but from, for example, an increased motivation to perform well. Finally, the effectiveness of an intervention is not only determined by performance improvements on memory tests, but even so by the subjective judgement of the participant.

Evaluation of an educational intervention (Chapter 8)

The results of an educational memory intervention directed at the reduction of worries about forgetfulness by giving information about memory and ageing are described in Chapter 8. In clinical practice, memory interventions often aim to change negative beliefs and expectations about memory in the elderly. The (implicit or explicit) assumption often is that changing these beliefs and expectations does not only improve subjective memory judgements, but also leads to improved memory performance. Surprisingly few studies, however, have evaluated these objective effects.

In this chapter an intervention directed at reducing negative stereotypes and worries about memory is described. Both subjective and objective effects were assessed in an intervention group (N=22, mean age 63 years) and compared to a no-treatment control group (N=23, mean age 61 years).

Subjects were very satisfied with the effect of the intervention. The intervention resulted in a more positive view about memory, as expressed in a reported increase in memory knowledge and a decrease in worries about forgetfulness. The intervention was especially beneficial for those subjects who initially experienced the strongest memory problems. The positive subjective effects, however, were not accompanied by an improved performance on memory tests.

These results show that an intervention addressing beliefs and attributions about memory can be effective in achieving more positive subjective memory judgements. However, if the aim of an intervention is to also improve memory performance, memory strategy training may be more effective.

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Evaluation of memory strategy training for remembering names (Chapter 9)

Memory strategy training programmes for those memory problems that were reported to give raise to the most frequent problems in daily life, namely remembering names, intentions, and texts are described and evaluated in Chapters 9, 10, and 11. All interventions consisted of 6 sessions of about one hour, which were distributed over three weeks. All subjects were trained individually. After each training session, subjects had to make homework and they were encouraged to practice the new material in their daily lives.

It was expected that after training, performance would improve on tests in which the strategy learned can be applied (*target tests*). In view of the specificity of the strategies taught, no generalisation to other aspects of memory (*control memory tests*) was expected: although all kinds of material might benefit from a deeper level of processing, it was assumed that practice in a specific strategy was required to improve performance since, for example, the strategy of attaching meaning to names cannot be directly applied to other verbal memory tasks. To control for motivational effects, visuo-motor reaction time tests (*control tests*) were included with the assumption that memory training as such should not have an effect on the speed of information processing. An equally important aspect of the evaluation of training effectiveness was the effect of training on subjective memory evaluations.

The effects of training were compared to two control conditions: a no-treatment group and an educational group (Chapter 8). Since comparisons of the demographic variables as well as the memory scores on the three evaluations showed that the educational group did not differ from the retest group, both groups were combined into one control group (N = 45, M = 62 years, range 45-84).

For the training programme for remembering names a strategy was developed that aimed to improve the learning of new names by increasing the meaningfulness of names. The underlying assumption was that the difficulty in remembering names lies in the fact that names are relatively meaningless and arbitrary. Several possible ways of achieving this were suggested and demonstrated to the subject, for example, thinking of a profession or an object with the same name, thinking of a word that sounds similar to the name or thinking of a familiar person with the same name. Subsequently, subjects were encouraged to connect the meaning of the name with the person. For this, all available knowledge about a person could be used: not only the person's physical appearance, but also for example his hobby or profession.

Older people do not only report problems with learning the names of newly met people, but also with the retrieval of well-known names. It was taught to try and retrieve a familiar name through the retrieval of other information available about the person and the name. For example, what is the profession of this person, where did I see him/her for the last time, what other names come to my mind, is the name short, foreign, or how many syllables

has the name.

The effectiveness of the training programme was examined in two groups of older adults. In study 1, trained subjects were between 43 and 87 years of age (N = 13, M = 70), control subjects between 45 and 84 years of age (N = 21, M = 70). In study 2, trained subjects were between 45 and 85 years of age (N = 26, M = 69) control subjects between 45 and 84 years of age (N = 45, M = 62).

In both studies, the names training groups showed a significant, but small, effect of training compared to the control group on the target memory tests. These training effects were still present three months after training. Moreover, participants were highly satisfied with the effects of training. On the other hand, the counter that indicated the number of failures in remembering names in daily life did not indicate a stronger decline in the trained group than in the control group.

It is unlikely that the increased names memory performance in the names training group is explained by motivational factors. Firstly because control memory performance had not increased. Secondly because also the education group found their training very gratifying and useful, but this was not accompanied by objective improvement in memory performance. Furthermore, also the absence of changes in reaction times argue against the influence of motivational effects.

The clinical relevance of the (significant) training effect can be estimated from the amount of improvement as indicated by effect sizes. The effect sizes show that the performance increases were rather small. The strongest effects of training were found for learning new names, with effect sizes in the moderate to large range (.63-.70). The effect sizes for the retrieval of familiar names were in the small to moderate range (.31-.53). Also when considering individual performance changes with the Reliable Change Index, training effects were modest. A different indication of the clinical relevance of the training effect is that at follow-up performance on the screening test half the participants in both names training conditions had improved to such an extent that they would not have been qualified for training any more. The very positive subjective evaluations of the training effect by the participants gives also an indication of the clinical relevance.

The effects of training did not generalise to other aspects of memory. Although in study 2 performance of the trained group on the control memory tests had improved slightly after training, it had returned to baseline level at follow-up.

In both studies, immediate training effects were not related to age or pre-training performance level. So, within the age range of our subjects (45-85 years), age did not influence the immediate training effects. In study 2, long-term effects were found to be largest for older subjects and subjects with a lower pre-training performance on tests for remembering names.

The results demonstrated that teaching strategies for remembering names directed at

giving more meaning to names is effective in reaching both subjective and objective memory improvements, which are retained at least several months after training has been ended. However, the amount of variance explained by training condition and the effect-sizes were rather small.

Evaluation of memory strategy training for remembering intentions (Chapter 10)

The results of a training programme for prospective remembering were evaluated in Chapter 10. Prospective memory is one of the most frequently used aspects of memory in daily life. People make plans for things to do continuously, such as remembering to make telephone calls, remembering appointments, or remembering to post a letter. Prospective memory concerns remembering to do something at a particular moment or specific situation in the future. Although the frequency of complaints about prospective remembering indicates the relevance of prospective memory training, the present study is one of the first on the effects of strategy training in this area.

When teaching an internal strategy to improve prospective remembering, one of the most important aspects seems to elaborate on the retrieval cue, for example by making it outstanding, specific and distinctive. Subjects were instructed to anticipate at encoding the retrieval situation as vividly as possible and to mentally mark one or more aspects of the retrieval context as retrieval cues. The training group consisted of 20 subjects, aged between 45 and 81 years. The effects of strategy training were assessed in comparison with the control group (N= 45, 45-84 years).

A major problem in training studies on prospective memory is the lack of reliable and ecologically valid measures. Surprisingly, this is a subject that is hardly addressed in the literature. Basic information about the measures used, like reliabilities are seldom presented. At our department, various pilot studies have been performed in order to find the most promising measures for the training evaluation study. Generally, test-retest reliabilities were disappointingly low, making the tests unsuitable for the evaluation of intervention effects. Despite repeated attempts to construct reliable prospective measures, we have not been able to do so: the test-retest reliabilities of the evaluation measures of the prospective training remained unsatisfactory.

The objective effects of training were evaluated with a telephone task which had to be performed in the daily life situation, and a prospective categorisation task performed in the laboratory. Despite the low reliabilities of the prospective tasks, a significant but small effect of training compared to the combined control group was found on the sum-score of prospective tests. The training effect was not related to age or pre-training performance level. At the three months follow-up, however, performance of the control group had increased to the level of the trained group. As expected, the positive training results on the prospective sum-

score did not generalise to other memory measures (assessed with tests for remembering names and texts) or control measures (assessed with visuo-motor reaction time tests).

As in the names training, participants in the prospective training group were very satisfied with the effects of training. But again, subjects in the educational training were equally positive about training effects. The counter that indicated the number of failures in remembering intentions in daily life did not show a significantly larger decline in the training group than in the control group.

The clinical relevance of the statistically significant improvement may again be indicated by effect sizes. The effect sizes showed a small performance increase on the prospective sum-score from pre to post-test in the trained group (.22) and a negative effect size for the control group. At follow-up the effect size was moderate, both in the training as the control group (.38 and .32 respectively). Individual performance changes calculated with the Reliable Change Index showed that none of the subjects in the training group showed a significant improvement on the prospective sum-score. The absence of a reliable change can be largely attributed to the low reliabilities of the evaluation measures. More impressive results may have been found with better retest reliabilities. Still, it means that also on an individual basis, effects of training are not impressive. The fact that training effects were rather small does not seem attributable to the strategy taught. Theoretically, no alternative internal strategies are evident.

Evaluation of memory strategy training for remembering texts (Chapter 11)

The third strategy training programme was directed at remembering texts (Chapter 11). In the literature, several methods have been proposed that are based on the strategies of organisation and elaboration. Most effective strategies for text recall seem to rely on organising or elaborating the information in the text. The advantage is that the new information is explicitly integrated into general knowledge in semantic memory. Although strategies for remembering texts are generally part of commercially available training guides, hardly any evaluation studies have been performed on the effectiveness of these strategies in improving memory performance. To our knowledge, no training studies have been published on the effectiveness of training these methods to older adults. Our strategy emphasised the identification of the main points of the text after a thorough reading and then summarising these main points in ones own words. The training group consisted of 20 subjects, aged between 46 and 78 years.

As in the other strategy training studies, after the intervention, participants in the text training group were satisfied with the effects of training. But again, subjects in the educational training were equally positive about training effects. The counter that indicated the number of failures in remembering things read or heard in daily life showed a significant decline, which was strongest in the trained group.

Unfortunately, the training did not yield any significant improvements on text memory tests, nor were there any delayed training effects at the three months follow-up. Inspection of the effect sizes, however, suggests that there are some training-related performance improvements: the trained group showed a moderate effect size of text performance from pre-test to follow-up (.58), while the effect size in the control group was small (.21). This suggests that the trained group improved a little more than the control group. Also when considering individual performance changes, results are somewhat more positive. Forty percent of the subjects in the training group showed a significant improvement on the text memory tasks, compared to 22% in the control group.

In absence of any significant effects on the target measures, it was no surprise that there were no effects of training on the control memory measures. There were no changes in reaction time performance on the control measures as well, suggesting that the lack of training effects did not result from a decreased motivation to perform well.

Apart from group results, individual differences in training effects were analysed more thoroughly. Much experimental research has been done on variables that influence text recall, and it would be interesting to know if the same variables influence the ability to benefit from training in this area. In older adults, the most prevalent influence on text recall is thought to be the age-related reduction in information processing resources. Especially the capacity of working memory tends to decline with age and rate of processing is slowed. Any reduction in processing resources as in the speed of processing is likely to curtail the depth and complexity of the semantic processing that can be carried out in the time available, resulting in poorer performance. Another variable that is found to influence text recall is verbal ability. High verbal adults are believed to have better memory for text, because they are more likely to participate in verbal activities such as reading, and to possess effective strategies for finding and utilising the organisation in texts. However, the results showed that the ability to benefit from training was not influenced by individual differences in demographic characteristics or psychological abilities, such as working memory, speed of information processing or verbal ability.

Taken together, there is no evidence for the effectiveness of the text training. Many subjects experienced difficulties in extracting the main points from a story or a conversation. Maybe the strategy was too academic and therefore of limited utility for remembering texts in daily life. Alternative strategies, however, are not obvious because summarising the contents of a text in ones own words seems to be an essential element in remembering texts.

The effect of memory strategy training on reported memory strategy use (Chapter 12)

In Chapter 12 it was investigated whether memory training leads to differences in reported use of memory strategies. In the previous chapters, three different strategy training programmes

were evaluated. The aim of the programmes was to teach easily applicable strategies for coping with these specific memory situations. A fourth training condition focused on providing information about memory and ageing. Only general strategies, like concentration and rehearsal, were discussed. All these training conditions have been found to have a positive effect on subjective memory evaluations. Objective results were demonstrated for the names and the prospective training. In the text training no such effect was found, nor in the educational training. The latter training, however, was not directed at improving memory performance. In this chapter it was investigated whether memory strategy training improves the quantity and quality of reported strategy use of normal older adults (N=111, mean age 63 years, range 46-85 years) in daily life. The four training conditions were compared to a retest control condition, because after repeated practice with memory tasks, subjects may spontaneously start using mnemonic strategies.

Three months after training, the *frequency of strategy use* as assessed by the scale scores had not increased more in the strategy training conditions than in the control condition. It was not only investigated whether subjects report using more strategies after training, but also whether individuals can be identified which are most likely to do so. The predictive value of the theoretically most interesting psychological variables (memory performance, memory complaints and mental speed) was investigated. No demographic or psychological characteristics were identified that could predict which individuals were most likely to change their strategy use. When strategies were analysed separately, only after names training a specific effect was demonstrated, indicating that subjects used more names strategies.

With regard to changes in the *strategies used in specific situations*, subjects in the names and intention training conditions reported an increase in the use of the trained strategies on names and prospective situations respectively. Moreover, there was some evidence of a generalisation of training to strategies that were not directly dealt with during training.

The control group showed that repeated practice with memory tests may result in changes in strategy use in specific situations, which are not always for the better. Experience with memory tests may increase the awareness of the usefulness of memory strategies, but may not provide knowledge as to which strategies are most effective.

Conclusion and discussion

This thesis focused on daily life memory in older adulthood. We chose to investigate everyday memory from various angles, combining subjective memory questionnaires with objective measurements with so called ecological memory tests in the expectation that this combination would give the broadest insight in everyday memory functioning.

The most important conclusions are, to our surprise, that older adults do not complain and worry as much about their memory as generally thought. The subjective judgements about their present memory functioning are rather positive. However, they do experience a decline

since young adulthood. Also with objective memory testing an age-related decrease in memory performance was found, even when the age range was limited to subjects aged 45 years and over, excluding young adults. No clear relations between subjective and objective measures were found, regardless of the way either of these were assessed.

Another aspect relevant for older adults daily lives is the ability to improve memory performance. The most consistent effect of the memory interventions was the subjective satisfaction with the effects of training, regardless what kind of intervention was received. This suggests that it is very important for the individual that his/her complaints are taken seriously. The way in which this attention is paid seems less relevant.

Unfortunately, not all our interventions yielded the expected performance improvements. If training resulted in performance improvements, this was only found on the target measures. Furthermore, the performance improvements found were small. None of the interventions lead to generalisation to other kinds of memory tests. Once more, this is a confirmation that if memory rehabilitation is to be effective, specific strategies need to be taught for specific memory problems.

Our results do not allow any conclusions about the generalisation of training effects to other groups of subjects with memory complaints or memory impairments. In our opinion, training in these groups may be expected to be at least as effective as in a group of healthy older adults. It may even be questioned if the memory problems older adults experience are severe enough to advise memory training. For healthy subjects the benefit of having a good instead of a moderate memory performance may not be rewarding enough to invest the time and energy needed to use the strategies on a regular basis. This may not be the case for neurological patients who suffer more from their memory problems. The most obvious (and maybe only) indication to refer older adults for memory strategy training is when there is a specific handicap, such as in remembering names. An indication for an educational intervention is when worries about memory are prominent.

To my opinion, the interventions described in this thesis are not suited for immediate use in the clinic. Ideally, an intervention should be a combination of a) education about memory in which attention is paid to memory functioning in general and to the beliefs the participant has about his/her own memory, b) practise in the effective use of external memory aids especially tailored to the needs of the individual subject. These aids should be easy to learn and to apply in daily life, and c) a package of memory strategies, practised in specific situations that the subject mentions as problematic in daily life. Also in the clinic, an individual training can be expected to be more effective than a group training. Individual and group sessions might be combined in one intervention, as the educational part (where emotional support and exchange are important ingredients) takes place in groups and the cognitive strategies are taught individually.