Only a small number of patients with epilepsy undergo a neurosurgical operation. With this, the area from which epileptic neurons generate seizures is removed. The road towards the realisation of an operation is long. Before the operation the patient undergoes many assessments from different disciplines, after surgery the patient has to be followed up to check the status. The thread in this thesis is chronological. From a neuropsychological perspective several different assessments and outcomes are being looked at.

Chapter 2 deals with research on the Wada test. In this test, devised by the Japanese neurologist Juhn Wada in 1949 and further elaborated in the sixties, the language-dominant hemisphere can be assessed (which is most often the left side) and can be predicted which individuals are at risk for post-surgical global amnesia. Intracarotid injections are performed by transfemoral catheterization with a shortlasting narcotic (amobarbital). The injected hemisphere is made inactive for 6 minutes, allowing assessment of the function of the still active hemisphere. The Wada test is thought to be sensitive to bilateral dysfunction of the critical memory function in the temporomesial area. We tried to do the reverse. If the Wada test showed a lower memory score in one hemisphere, could this be related to the side of focus? We applied a statistical technique (logistic regression) in which we included four variables: both memory scores after injection, memory of a story told before injection, and an attention score – the moment at which the patient has recovered such that he can be tested. With this set of variables the side of a focus can be classified in 85% of the patients. Additionally, false prediction results in a slightly lowered chance of becoming seizure free.

Chapter 3 follows naturally from chapter 2. When the Wada test shows that the side of focus is the eloquent side of the brain, the neurosurgeon has the option of operating under local anaesthesia – the so called Penfield procedure – in which the operation can be carried out without damaging the language areas. This is not always necessary or possible (the procedure can be too stressful for the patient). An operation under Penfield conditions is offered to about 40% of the patients with a focus in the language dominant side. Not performing an operation under Penfield conditions might include a risk of damaging the anterior language areas. We looked at cognitive differences between both procedures six months after surgery. We found a relationship between the extent of the removed brain tissue in the superior temporal gyrus under general anaesthesia and a lowered verbal IQ and verbal comprehension.

In chapter 4 we described a study on differences in auditory rhythm perception in both cerebral hemispheres. It is known that longer visual rhythms appear to be better (holistically) processed by the right hemisphere. We used a rhythm test which consisted of 30 pairs of rhythms varying in length from 5 to 7 elements. We expected that the removal of brain tissue in right-sided resections should lead to a diminished recognition of longer rhythms. This appeared to be the case. With this, the notion that functional differences between left and right hemisphere can be regarded as analytic or holistic processing of information respectively is enhanced.

Chapter 5 deals with the effects of an operation on intelligence. It is known from
literature that half a year after left temporal lobe surgery verbal intelligence shows a slight decrease and performal intelligence shows less increase after right surgery than after left temporal lobe surgery. We followed now patients 6 years after surgery (with assessments after six months, two years and six years). This offers a unique opportunity to study the effects in the long term. This study showed that the decrease of verbal IQ after left temporal lobe surgeries is undone after two years. From two to up to six years this IQ shows an increase of up to normal values. There are not many differences between patients who have been operated on and assessed more than once. The latter always yields a retest effect, otherwise known to be a normal increase in retesting.

Chapter 6 is devoted to long term follow-up of verbal memory. This function is purported to be a risk function in left temporal lobe surgery. After these operations verbal memory changes are noticeable. Not known however, were the effects in the long term. In all patients the hippocampus (as important relay station to long term memory) and part of the neocortex is resected. The study revealed a specific group at risk. This group consists of patients with mesiotemporal sclerosis with an atrophic hippocampus. Verbal acquisition and consolidation in general shows an ongoing decrease up to two years after surgery, but the verbal memory of patients with a diagnosis of mesiotemporal sclerosis shows an ongoing decrease up to six years after surgery. To give an indication of the effect, the latter group had scores which were 15% below the assessment before surgery. This is not dramatic, but quite striking. It is not sure whether patients experience this as a nuisance because memory complaints do not go hand in hand with memory failure. It would be advisable to follow this very group further to unravel the mechanisms behind these differences in decrease.