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**Narrative comprehension: Is there a difference
between patients with left versus right hemisphere
damage?**



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Content

<i>ABSTRACT</i>	3
<i>1. INTRODUCTION</i>	4
1.1. <i>Situation model</i>	5
1.2. <i>Narrative shifts</i>	9
1.3. <i>Lesions and functions of Broca’s area and its right homologue (BA 44/45)</i>	10
1.4. <i>Research question and hypotheses</i>	14
<i>2. METHOD</i>	17
2.1. <i>Subjects</i>	17
2.2. <i>Material</i>	20
2.3. <i>Procedure</i>	23
2.4. <i>Variables</i>	24
2.5. <i>Design</i>	24
2.6. <i>(Statistical) Analysis</i>	25
<i>3. RESULTS</i>	27
<i>4. DISCUSSION</i>	38
4.1. <i>Discussion of the method</i>	38
4.2. <i>Discussion of the results</i>	40
4.3. <i>Clinical relevance</i>	44
<i>5. SUMMARY AND CONCLUSION</i>	46
<i>6. OUTLOOK</i>	48
<i>REFERENCES</i>	49
<i>APPENDIX 1 – Raw data</i>	53
<i>APPENDIX 2 – Texts</i>	63
<i>APPENDIX 3 – Participant information</i>	72

ABSTRACT

Introduction: The current study investigates the facility of different causes of deficits in narrative comprehension in patients due to left versus right hemisphere brain damage (LHD, RHD). Based on the observation that both impairments, LHD as well as RHD, manifest in bad story comprehension, although only LHD is known to generate aphasia, different mechanisms underlying their respective comprehension disorders are suggested. Whereas LHD patients' problems seem to arise from a language deficit, RHD patients might offer a general deficit in situation model building. Thus aphasic patients due to LHD should be able to understand a story, when the presentation mode is non-verbal, e.g. silent movie. Opposite to them, RHD patients should have problems in either respective presentation mode, verbal and non-verbal. The study relies theoretically on the assumptions of the situation model and narrative shifts.

Method: Two patients with LHD are compared to two patients with RHD and to individually matched controls. Every participant listened to four spoken stories (verbal presentation mode) first, and afterwards watched four silent movies (non-verbal presentation mode) from the series of *Mr. Bean*. In both presentation modes participants were implicitly asked to identify narrative shifts in order to find out, if they were able to build a situation model during story comprehension.

Results: Due to the small amount of participants, only trends could be seen regarding differences in narrative comprehension between LHD and RHD patients. LHD patients tend to identify only few shifts, whereas the RHD patients acted comparable to the control participants regarding the shift-behavior. In all patients the verbal presentation mode seemed to have an advanced benefit compared to the non-verbal presentation mode.

Conclusion: This study could neither confirm nor reject the proposed hypotheses. No conclusions could be drawn based on this small sample. Also the participants within one "group" differed too much from each other and the instruction seemed to be insufficient for this target group.

1. INTRODUCTION

Intact narrative comprehension is one prerequisite for dealing with everyday situations like participating in a discourse, following other people's talk or watch a movie. As documented in neuropsychological research studies, this ability can be impaired in stroke patients after left as well as right frontal brain damage, both affecting Brodmann areas (BA) 44 and 45 (Broca's area and its right homologue). Language is thought to be represented predominantly in the left hemisphere and language capabilities are, at first sight, typically spared in right hemisphere damaged patients (e.g. van Cranenburgh, 2004). Therefore the comprehension disorder following right frontal lesions raises the question, if this disorder might be related to language independent, more domain-general cognitive functions, probably being located in a network involving Broca's homologue. Indeed imaging studies on disturbed and intact narrative comprehension revealed that a widespread bilateral network and, therein especially the prefrontal cortices, play an important role in the comprehension of coherent text (e.g. Mar, 2004; Côté et al., 2007; Ash et al., 2012). In addition, theories of mental models nowadays indicate an involvement of domain-specific as well as domain-general processes in narrative comprehension. The role of the left BA 44/45 seems to be language related and is only relevant, if the story is presented as coherent text (Kaan & Swaab, 2002). In contrast, the right BA 44/45 is associated with the conceptual integration of meanings into broader context (Mar, 2004).

The current study is investigating the possibilities to differentiate between these language related domain-specific and language independent domain-general processes of narrative comprehension involving frontal cortices in both hemispheres. Thus, the comprehensive capabilities of two stroke patients with unilateral lesions in the left and two stroke patients with unilateral lesions in the right BA 44/45 are examined. In order to differentiate between domain-general and domain-specific disorders, they all will be shown the same narratives in two different media, i.e. spoken texts and silent movies. As an indicator of difficulties in narrative comprehension, the recognition of so-called narrative shifts is chosen. Narrative shifts belong to the theory of situation models (Kintsch & Van Dijk,

1978) and comprise the shift from one mental model of a narrated situation to another due to strong event-boundaries. According to this very popular model of narrative comprehension, narrative shifts represent a domain-general parameter, since they are introduced by input-modality independent changes in relevant content information, e.g. person, time, location, emotion or action characterizing an event. Additionally, narrative shifts are seen as a marker of the boundary between the mental representations (situation models) of interrelated but different situations or events. Therefore, a narrative shift can be identified only, if domain-general processes of narrative comprehension, like the construction of situation models, are intact. On the other side, the ability to build up situation models is a necessary but not sufficient condition for intact narrative comprehension, because beforehand one certainly also needs to decode the code in which the story is presented (surface).

In order to ground the current study and make it more graspable, the first chapter will give an overview of the background in terms of the notion of the situation model and narrative shifts. Next, disorders of narrative comprehension following unilateral left or right hemisphere's stroke involving BA 44/45 will be introduced and the functional anatomy of BA 44/45 will be discussed. The given information will result in the research question of the study and will motivate hypotheses related to them. In the second part of this paper, more detailed information about the study's method, the results, discussion and conclusion will be presented.

1.1. Situation model

The situation model is based on the theoretical assumptions of text linguistics and it models the way in which, continuously incoming narrative language is processed mentally (e.g. Kintsch & van Dijk, 1978). It hypothesizes an online analysis of microstructure, thereby extracting micropropositions (the main statements of a text, detached from the surface structure) that are merged into macropropositions (units of meaning of several micropropositions), which results in the construction of a global text base. Thus, the building of a situation model is derived from the linguistic formulation of a text, but relies on macropropositional event structures. The main units within this model are events consisting of information about

actions, objects, characters, time, space, goals, causes, emotional state etc. (Speer et al., 2007; Ferstl et al., 2005). Out of this information and with the help of the recipient's world knowledge, a mental representation of the narrated situation is rebuilt (van Dijk, 1995; Ferstl & von Cramon, 2005). The contributions of individual world knowledge make each situation model personal, subjective, ad hoc and unique (van Dijk, 1995; Ferstl & von Cramon, 2005). Since every new piece of information is integrated into the actual situation model, the model has to be updated concurrently, thereby matching continuously incoming, new information with already processed and integrated information. The continuous update guarantees the model to be as coherent as its narrative input and to initiate the shift to a new situation model, each time incoming information does not converge with the existing situation model and thus cannot be integrated into it anymore.

The more detailed mechanisms of this model involve some text-linguistic terms that first need to be introduced shortly: *micropropositions*, *macropropositions*, *cohesion* and *coherence*. *Micropropositions* are the main statements of a text detached from its syntactic-morphological structure. These propositions come in three types, which are hierarchically ordered: obligatory, optional and idiosyncratic. Obligatory micropropositions are essential for a text to be understood whereas idiosyncratic micropropositions just have small added value. Optional micropropositions are optional to the recipient, which means that they might or might not be present in a text. After perceived information is segmented into micropropositions it is important to find relationships between them. This is done by cohesion and coherence. *Cohesion* is the way in which components of the surface structure (syntactically, morphologically and lexically) are related to each other (De Beaugrande & Dressler, 1981). In example (1a) the relationship between the two statements is built by the use of the conjunction *although* and the use of the pronoun *he*. In (1b) no cohesive medium can be found.

(1a) cohesive: *Although James is sick, he goes to work.*

(1b) incohesive: *James is sick. James goes to work.*

Coherence is the content-related affiliation of texts, which is done by cognitive processes and the activation of world knowledge (De Beaugrande & Dressler, 1981). Whereas a connection of the statements in (2a) can easily be established, the statements in (2b) cannot be connected.

(2a) coherent: *Steve buys a new suit. A job interview is coming up.*

(2b) incoherent: *Steve buys a new suit. The flowers have not been watered in a long time.*

When the relationship between micropropositions has been established, they will be combined into coarser units of meanings. These are denoted as *macropropositions* by e.g. Kintsch & van Dijk (1978). With the use of macrorules the semantic information can be structured into content chunks or events. Van Dijk (1980) describes three macrorules: selection, generalization and construction. These rules derive macrostructures from microstructures. The first macrorule is selection (deletion), in which all micropropositions, relevant for the interpretation of the text, are selected. Conversely, this means that all micropropositions irrelevant for the gross interpretation are deleted. This process is context dependent: If a microproposition is not required to understand the coarse content of a narration but gives additional details, it is evaluated irrelevant and will be omitted. In example (3) only the important message (3b) is selected from the sentences in (3a).

(3a) *"A man passed by.*

He wore trousers.

The trousers were blue."

(3b) *"A man passed by".*

If the story is about a man and not about his trousers, the precise description of his clothes can be seen as additional and unnecessary details.

In the second macrorule, generalization, a more general proposition is constructed, abstracting from the semantic details of the respective sentences. Individual

participants may be grouped in this macrorule, thus replacing a list of words or items by a more general word in the same class, involving producing a superordinate term. The messages from example (4a) may be summarized into the message of (4b).

(4a) *"A screwdriver lay on the ground.*

A hammer lay on the ground.

Nails lay on the ground."

(4b) *"Tools lay on the ground."*

Following both rules, selection and generalization, information is thus left out in the resulting macropropositions. In the last macrorule, construction, macropropositions are substituted, resulting in a more or less stereotypical sequence of events (van Dijk, 1980). Several propositions are thus joined as one all-embracing action/concept and replaced by a proper proposition, implying a global fact. All the messages in example (5a) may therefore be shortened into the single message in (5b).

(5a) *"I went to the supermarket.*

I took a shopping cart.

I went to the vegetable division.

I put tomatoes into the shopping cart.

I went to the register.

I paid for my purchases."

(5b) *"I went grocery shopping."*

Newly received information is integrated into an existing situation model as long as the information can be coherently placed into this situation. Simultaneously individual world knowledge is integrated so that inferential conclusions can be drawn. Thus, situation models are mental representations of a narrative event-structure consisting of content based information about persons, objects, places,

time, events and actions. Emotional reaction of the recipient evoked by the narration is assumed to be also part of the mental model he builds from the narrated situation (Ferstl et al., 2005). When a new situation model is built (if the incoming information is not matching the current model anymore) the previous model still stays available, so that the recipient can easily go back to previous situations when information requires this.

Since the mental model is content based and represents the event-structure, it is assumed to be independent of the medium in which a story is given, e.g. language (text) or images (silent movie) and film (Zacks et al., 2001; Klann & Huber, 2011). Therefore a situation model is not domain specific but domain general. This also accounts for the fact that people remember information but do not remember whether they read about it, seen it on TV or might even participated in the event themselves (van Dijk, 1995; Zwaan & Radvansky, 1998).

Additionally, with the situation model it is possible to explain why we can pick up and combine information from different sources. Learning often requires the integration of information from different sources, but still we combine all the information and store it as one. We thus integrate all the (often overlapping) information into a common situation model of the topic we are studying (Zwaan & Radvansky, 1998).

1.2. Narrative shifts

Whenever a new situation model has to be composed because the narrated situation cannot be accommodated by an existing model, a narrative shift is executed. Thus a narrative shift is defined as an event boundary, indicating the switch between situation models. A person's ability to identify narrative shifts is seen as a good parameter of the person's narrative comprehension ability on a domain general level, independent from input modality (e.g. film, read text, spoken text) and represents the starting point of the building of a new situation model (e.g. Klann & Huber, 2011; Rich & Taylor, 2000; Speer et al., 2007; Speer & Zacks, 2005; Whitney et al., 2009; Zacks et al., 2001).

Therefore, this parameter is suspected to be well equipped to uncover and confine problems in narrative comprehension after stroke, that are related to a domain general, content-based conceptual perception deficit from mere language related, domain-specific comprehension deficit due to aphasia (Klann & Huber, 2011). Up to now, there is no means to distinguish between these two disorders that naturally manifest themselves in one and the same symptom of poor narrative understanding.

There are several types of narrative shifts: changes of character, place, time, intention or emotion. In changes of character, there is a change of the protagonist or of another character involved in the plot. If, for example, the focus of a story is on a person in a barber shop and suddenly another person steps into the shop, a change of character was indicated. Changes of place refer to the place of the plot. A flashback or foresight are examples of changes of time, since there is a change of the narrated time. By changes of intention, fundamental changes in the protagonist's goals or actions are meant. For example, the protagonist could aim for getting ice-cream but suddenly decides to get some pizza instead. Changes of emotion refer to fundamental changes in the affect/emotional state of the protagonist, like surprise, fear or joy (Zwaan & Radvansky, 1998).

The current study investigates the recognition of narrative shifts in patients with left and right frontal lesions involving BA 44/45. Therefore the following chapter will give information about the consequences of lesion in the left or right BA 44/45 and of each respective area's function.

1.3. Lesions and functions of Broca's area and its right homologue (BA 44/45)

In 1909 the German anatomist Korbinian Brodmann published a map of cortical areas in human brains based on the cytoarchitectural¹ organization of neurons. He described a total of 52 areas which are referred to as Brodmann areas (BA) and still are the most widely known and used cytoarchitectural organization of the

¹ Cytoarchitecture refers to the arrangement of cells in a tissue, especially the arrangement of nerve-cell bodies in the cerebral cortex.

human brain. For the current study the Brodmann areas 44 and 45 (Broca's area) are the most important. Therefore the following information focuses only on the Broca's area. Figure 2 presents the lateral surface map of the cortex of the left hemisphere, with Brodmann areas indicated by numbers.

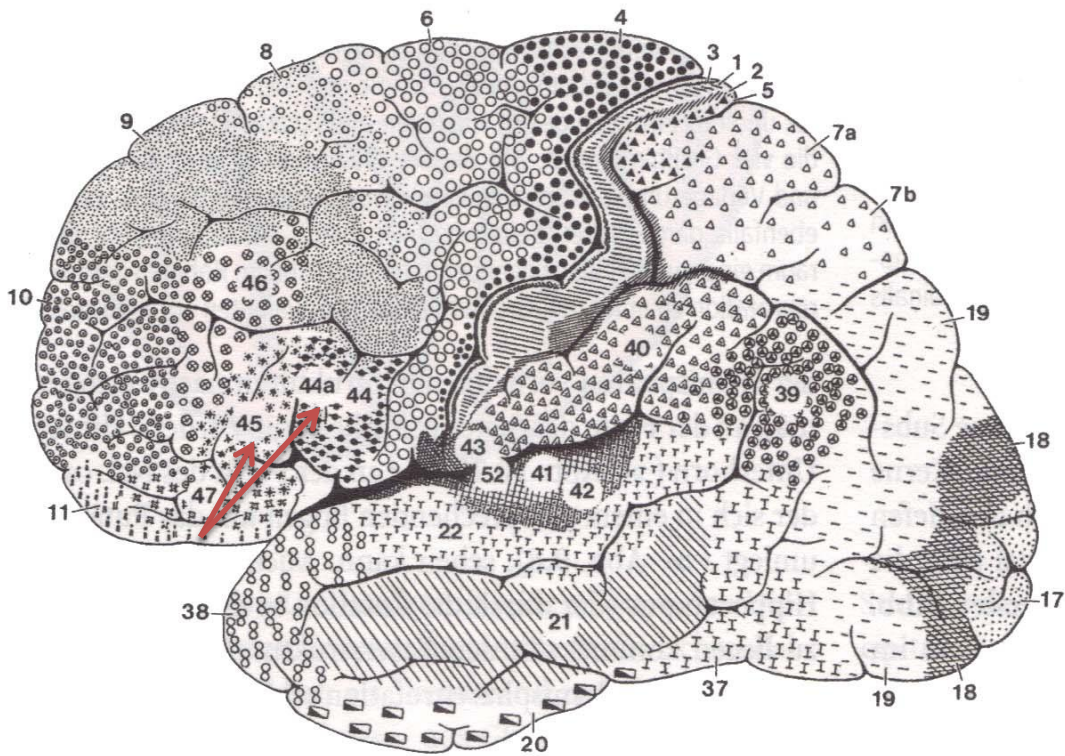


Figure 1: Brodmann areas on the lateral surface (BA 44&45 are highlighted with arrows) (modified after Trepel, 201; p. 204).

BA 44 (pars opercularis) and BA 45 (pars triangularis) together constitute Broca's area in the left hemisphere. Both areas are situated in the prefrontal cortex of the brain. Federenko et al. (2012) point out that there are two sub regions in Broca's area lying side by side, one of which is "specifically engaged in language processing, surrounded by another that is broadly engaged across a wide variety of tasks and content domains" (Federenko et al., 2012, p.2059). This means that in Broca's area there are domain specific (language) as well as domain-general functions situated. The domain-general functions may include "hierarchical structure building, aspects of actions processing, working memory or cognitive control" (Federenko et al., 2012, p.2059). Domain-specific problems with e.g.

syntax may be a “result of a temporal processing deficit in activating or integrating information, or a shortage of resources needed for these processes” (Kaan & Swaab, 2002, p.352). However, the most common syndrome resulting from left brain damage in Broca’s area is aphasia. Aphasia is defined as “an acquired primary language disorder caused by damage to the brain, with the comprehension and production of spoken and written language being impaired” (Dharmaperwira-Prins, 1998, p.21). The notion of *acquired language disorder* implicates, that exclusively those language disturbances are subsumed under *aphasia* that affect completely acquired language functions (e.g. in contrast to developmental disorders). The term *language disorder* refers to the fact that non-verbal memory/cognition should (primarily) be unimpaired. Comprehension as well as production of spoken, written and signed language may be impaired. This does not mean that every aphasic patient is impaired in all of these domains in the same way. It is possible that just one domain is impaired, while the others are relatively intact.

Since in 90-95% of all people networks involved in the representation of language functions are situated predominantly in the left hemisphere, aphasia is usually associated with lesions in the left hemisphere (van Cranenburgh, 2004). Aphasia used to be classified into several sub-groups: Broca’s, Wernicke’s, amnesic and global, referring to the predominant symptoms a patient shows. This classification is no longer adequate, since symptoms cannot always be addressed to just one group. Symptoms concerning the current study are those that follow left frontal stroke affecting BA 44/45. The symptoms may include telegraphic speech (speaking without functional words, just giving the basic, most important information), problems with word retrieval and production and relatively good or mildly impaired comprehension. Moreover, patients will typically speak non-fluently. The problems might be seen in writing as well.

In contrast to left lesions of BA 44/45, damages of its right homologues are more concerned with domain-general cognitive deficits. Although right hemisphere damage in general / at first sight is not associated with language systematic deficits on a lexical or grammatical level, but an estimated 50% of individuals with

a lesion in the right hemisphere are likely to show up with discourse problems that are related to semantic, prosodic and/or pragmatic comprehension and production deficits (Coté et al., 2007). Additionally the right Broca's homologue is suggested to be engaged in functions relevant for narrative comprehension. In narrative discourse, those right frontal damaged patients are reported to have a lower level of informativeness compared to neurologically healthy people (Ferstl et al., 2005). This supports the hypothesis of the right frontal hemisphere being involved in the organization of information in narrative discourse (Marini, 2012).

In view of the relative paucity of studies on right BA 44/45 lesions and their consequences, this view can be supported by imaging the intact brain at work. For example, Ash et al. (2012), reveal a major involvement of the (right) frontal cortex in the comprehension as well as expression of narrative discourse. Also Mar (2004) refers to the right BA 44 & 45 also as playing a role in narrative comprehension, being suited for the coarse and distal interpretation of free associations. This is in line with the findings of Robertson et al. (2000), who investigated brain activation during the perception of connected versus disconnected sentences in healthy participants. Coherence was omitted or marked by definite articles. Right frontal areas were activated when connected sentences were processed but not in the "unconnected sentences" condition.

Another common assumption is that the right BA 44/45 is concerned with the integration of new information into an existing context and processes like inference and conceptual association, may it be conveyed via language or any other media (Robertson et al., 2000; St. George et al., 1999; Bottini et al., 1994). Taken together this hints at an involvement of right BA 44/45 in a coherence/inference related network and to modality independent domain-general functions of narrative comprehension (Mason & Just, 2006).

Zacks et al. (2007) argue that situation models may be implemented by the anterior lateral prefrontal cortex (BA 45/46). The prefrontal cortex has been associated with script processing and seems to integrate multimodal information about narrated situations: its dysfunction is related to an impairment of the access to situation models (Zacks et al., 2007).

Ferstl et al. (2005) describe that patients with prefrontal lesions have “problems with both on-line inference processes and extracting the sequential order of story events, a process that reflects situation model building” (Ferstl et al., 2005, p.725). This is confirmed by Zalla et al. (2002), showing that patients with frontal lobe lesions have deficits in an early stage of comprehending a story. In these stages the ability of reconstructing the consecutive links among events and the extracting of inferential knowledge from a text are involved.

Concluding, one can say that especially the prefrontal cortex of both hemispheres, with specified therein BA 44 & 45, seems to play an important role in domain-specific (language-related) and some domain-general functions of narrative comprehension. These domain-general functions and input-modality independent processes are mainly situated in the right hemisphere, whereas the domain-specific language related functions (phonological, lexical and grammatical functions and representations of linguistic units) are situated in the left hemisphere.

1.4. Research question and hypotheses

In the former chapters it was shown that some functions relevant for narrative comprehension are strongly lateralized in terms of their neuroanatomical representation. Whereas domain-specific language functions like phonological, lexical and grammatical functions and also domain-specific representations of linguistic units (phonemes, morphemes, lexemes, syntactical rules) seem to be related more to the left hemisphere, the right homologue of Broca’s area seems to subserve more domain-general and input-modality independent processes, e.g. contextual integration and recognizing narrative coherence (without regard to the presence of linguistic markers of coherence). It was also explained how the situation model integrates all incoming (important) information with previous knowledge into one model and how narrative shifts represent the changes between situation models and thus an important parameter to mirror someone’s ability to build a situation model during online comprehension.

Up to now, there are no systematic comparisons of left and right frontal lesions following brain damage in respect to the faculty of domain-specific and –general narrative comprehension like using the same paradigm for both types of brain damage, LHD and RHD. Therefore, it is still an open question, what causes the story comprehension problems in RHD as compared to LHD. With the given information the following research question can be formulated: *Is there a difference in narrative comprehension in patients with left hemisphere brain damage and patients with right hemisphere brain damage?*

To answer the research question, several sub-questions have to be addressed:

- Is there a difference in the identification of narrative shifts between patients with left and right hemisphere damage in the non-verbal presentation mode?
- Is there a difference in the identification of narrative shifts between patients with left and right hemisphere damage in the verbal presentation mode?
- Is there a difference within patients with left hemisphere damage in the identification of narrative shifts between the verbal and non-verbal presentation mode?
- Is there a difference within patients with right hemisphere damage in the identification of narrative shifts between the verbal and non-verbal presentation mode?

In view of the findings reported in the literature it is hypothesized that right lesioned patients will be disordered in the non-verbal as well as the verbal presentation mode task, since for both tasks the building of situation models is a necessary prerequisite. Patients with left frontal lesions are expected to have no problems in the non-verbal but in the verbal task because they suffer from domain-specific deficits but not from domain-general problems in situation model building. Hence, the study addresses the following four hypotheses:

1. H₀: In patients with left hemispheric brain damage, there is no difference in the identification of narrative shifts between the non-verbal and verbal presentation mode.
H₁: There is a difference in the identification of narrative shifts in patients with left hemispheric brain damage between the non-verbal and verbal presentation mode in favor of the non-verbal presentation mode.
2. H₀: In patients with right hemispheric brain damage, there is a difference in the identification of narrative shifts between the non-verbal and verbal presentation mode.
H₁: There is no difference in the identification of narrative shifts in patients with right hemispheric brain damage between the non-verbal and verbal presentation mode.
3. H₀: In the non-verbal presentation mode, there is no difference in the identification of narrative shifts between patients with brain damage in the left and patients with brain damage in the right hemisphere.
H₁: There is a difference in the identification of narrative shifts in the non-verbal presentation mode between patients with brain damage in the left and patients with brain damage in the right hemisphere in favor of left lesioned patients.
4. H₀: In the verbal presentation mode, there is a difference in the identification of narrative shifts between patients with brain damage in the left and patients with brain damage in the right hemisphere.
H₁: There is no difference in the identification of narrative shifts in the verbal presentation mode between patients with brain damage in the left and patients with brain damage in the right hemisphere.

2. METHOD

Narrative comprehension on domain-general versus domain-specific language level was investigated in left and right hemispherical damaged stroke patients with a lesion affecting BA 44/45 and in a “group” of individually matched healthy controls. All participants watched a silent movie from the series of *Mr. Bean* (non-verbal presentation mode). Additionally the participants listened to a verbal rendition of the same *Mr. Bean* episode (verbal presentation mode). In both presentation modes the participants were implicitly asked to identify narrative shifts. This was done by instructing them to press a button (the right mouse-button) when they feel, something new is happening as compared to episodes in a story².

2.1. *Subjects*

Two patient-groups (with left and right hemisphere brain damage) were compared to each other and to a “group”³ of (matched, healthy) controls. Since patients with right hemisphere brain damage are difficult to find and due to the fact that this study is a pilot study, the study was done with a small number of patients. The goal originally was to compare five patients with left to five patients with right hemisphere brain damage. Due to problems in recruiting the patients, the study was eventually executed with two patients with left and two patients with right hemisphere brain damage. The control participants were matched to the patients

² Former studies confirmed that this is a good task to detect narrative shifts. In those pre-studies, theoretical linguists that were well informed about the notion of narrative shifts identified narrative shifts in the four episodes of *Mr. Bean* as well as in a longer narration of an Indian boy. Participants not familiar with the ideas of narrative shifts were asked to indicate via right mouse-click, if they feel something new is happening as compared to episodes in a story. There was a 100% convergence between the participants` reactions and the shifts detected by professionals (unpublished material, Klann & Huber).

³ It is important to mention at this point that due to the small amount of participants one cannot really refer to groups in this study. Nevertheless, this term will be used in this paper in a compromising way.

on age, sex and educational level on an individual basis. Thus, the control “group” consisted of four healthy participants, being most comparable to the patients on its best possible rate. Due to this fact, the control participants had to be recruited and assessed after all patients, participating in the study, had been recruited.

Patients were recruited from several hospitals: left hemisphere brain damaged patients from the University hospital of the RWTH Aachen University and right hemisphere brain damaged patients additionally from a rehabilitation center in Meerbusch (St. Mauritius Therapieklinik).

The patients had to be older than 18 years in order to participate, to exclude childhood aphasia, where language problems and especially their recovery are suggested to be very different from adult aphasia. The lesions had to be exclusively in the left respectively right BA 44/45 resulting from a stroke and the patients should not suffer from any other neurological or psychiatric diseases. In order to assure that possible problems with the recognition of narrative shifts were not due to a lack of concentration, patients needed to be able to work and concentrate for at least one hour. Cognition as well as comprehension should not be severely impaired, since this might influence the results. Participants with a degree in linguistics (e.g. speech and language therapy) had to be excluded as well, since they might have specific knowledge about linguistic processes. Both sexes were included. Due to a higher potential on atypical lateralization of language function, left-handers were spared. Patients with left hemisphere brain damage were supposed to have “Broca’s”, non-fluent, aphasia, assessed with the AAT (Aachener Aphasia Test; Huber et al. 1983).

In table 1 the in-/ exclusion criteria for the patients in this study are summarized.

Left hemisphere	Right hemisphere
Older than 18 years	
Lesion resulting from stroke (ascertained by a CT or MRI scan)	
Able to work / concentrate for at least one hour	
No (additional) neurological diseases (e.g. Parkinson's disease, MS,...)	
Comprehension not severely impaired	
Cognition not (severely) impaired	
No degree in linguistics	
Lesion in Broca`s-area (Brodmann area`s 44 & 45)	Lesion in the Broca homologue (Brodmann area`s 44 & 45)
„Broca`s“ aphasia	
Aphasia assessed with AAT (Aachener Aphasie Test; Huber et al. 1983)	

Table 1: in-/ exclusion criteria for the patients

Participants in the control “group” did not suffer from any neurological conditions (e.g. previous stroke, Parkinson's disease, MS, etc.). General cognitive functioning of the control participants was evaluated with the Mini-Mental State Evaluation – (MMSE) (Folstein, Folstein & McHugh, 1975), which is developed for research purposes as a rapid cognitive screener. The MMSE consists of 30 items, addressing registration (repeating named prompts), orientation in time and place and recall tasks (memory). The maximum score is 30.

Table 2 summarizes the main information about the participants. Please note that patient LHD 2 only had a lower score on the MMSE due to his aphasia. He could not write and repeat words, but his general cognitive functioning was good.

Exprimentee nr.	Age	Education / Employment	Sex	Handedness	Side of brain damage	Result MMSE
RHD 1	75	Primary school, bookbinder	Female	Right	Right	23
RHD 2	58	Primary school, Official (trains)	Male	Both	Right	29
LHD 1	47	College, teacher	Male	Right	Left	29
LHD 2	52	Secondary education, official (city)	Male	Right	Left	21 (due to aphasia)
RHD C 1	74	Primary school, nursery worker	Female	Right	None	29
RHD C 2	58	Primary school, chemistry laboratory worker	Male	Right	None	30
LHD C 1	47	College, official (police)	Male	Right	None	30
LHD C 2	53	Secondary education, official (research center)	Male	Right	None	30

Table 2: main information about the participants.

2.2. Material

The materials for this study were taken from a previous study (Klann & Huber, 2011). They consist of four silent movies from the series of *Mr. Bean* (at the mall (6.45 min)⁴, at the poolside (4.19 min)⁵, at the barber's (10.06 min)⁶, at the Queen's (6.33 min)⁷). Each movie is four to ten minutes long, resulting in a total length of approximately 28 minutes. Furthermore the paradigm consists of a recording of four spoken stories, matching the movies. Therefore, in a prestudy, a propositional analysis was made, based on the content of the movies. Afterwards texts were constructed that (a) contained all macropropositions presented in the movies, (b) kept every content that was identified to surround the narrative shifts

⁴ From the episode „Return of Mr. Bean”

⁵ From the episode „The curse of Mr. Bean”

⁶ From the episode „Hair by Mr. Bean of London”

⁷ From the episode „Return of Mr. Bean”

detected in the pre-studies by healthy participants (Klann & Huber, 2011) and (c) were of equal length. It was tried to prevent the appearance of linguistic surface markers like adverbs or prosodic markers at those propositions in the text, where narrative shifts were identified in the movies (Klann & Huber, 2011).

The materials consisted of changes of location, time, person, emotion or action. The different changes will be described below.

Changes of location:

A change of location is defined as a relocation of events from one location to another. A distinction between “big” and “small” changes of location can be made: “big” changes of locations are for example the change of a building, whereas “small” changes of locations might be the switching from one room to another in the same building (e.g. from the closet to the bed). People tend to perceive the small changes better than the bigger, since they are more likely to be relevant to the story (see Zwaan, 1999). Both types of location changes can be a trigger for the building of a new situation model.

Changes of time:

A change of time denotes a change in the story time, e.g. first there is a scene in the morning followed by a scene in the evening. A flashback is a change of time as well (see Zwaan, 1999).

Changes of person:

When a new person is introduced or a known person leaves, left beforehand and comes back etc., a change of person takes place (see Zwaan, 1999).

Changes of emotion:

A change of emotion refers to a switch or modulation of emotional state. This might affect the emotions of the protagonist or the recipient.

Changes of action:

Within a change of action a switch between two macropropositions takes place, without a change in the external factors like location, person, time and emotion. The change only takes place, if something of the action changes in such a fundamental way, that a new macroproposition has to arise (see Schulte & Väisänen, 2006).

The *Mr. Bean* movies and text used in this study contained several of these changes. An overview of the amount, length and type of raised narrative shifts can be found in table 3, established by an expert rating with three judges and confirmed by a prestudy (Klann & Huber, 2011).

	Narrative shift nr.	Times of the narrative shifts in s	Type of the shift
Mr. Bean at the mall	1	80-88	Place
	2	124-130	Place
	3	164-168	Place
	4	184-190	Place
	5	229-232	Place
	6	257-263	Place
	7	283-290	Person
	8	343-345	Place
Mr. Bean at the poolside	9	32-39	Person
	10	62-72	Place
	11	156-160	Person
Mr. Bean at the barber's	12	76-80	Action
	13	104-108	Person
	14	148-156	Person
	15	295-297	Person
	16	310-313	Person
	17	395-400	Person
	18	554-556	Person
	19	577-580	Person

Mr. Bean at the Queen's	20	18-28	Place
	21	66-70	Action
	22	98-102	Person
	23	173-180	Action
	24	254-257	Action
	25	306-310	Action
	26	340-343	Person
	27	348-352	Action
	28	378-380	Action

Table 3: objective determination of narrative shifts

2.3. Procedure

All participants were visited three times: in the first meeting participants were asked for informed consent. On the second meeting the participants listened to the stories and watched the silent movies on the third meeting. At the end of the third meeting a short cognition test was done (MMSE)⁸.

In sessions two and three, patients were instructed to press a button whenever they feel that something new is happening / about to happen in the story (implicit identification of narrative shifts)⁹. Every button-press (as mentioned before) was recorded precisely with regard to time in milliseconds (ms) and was assigned to the individual position in the story. This was done with the computer program *Presentation* (version 0.71.09.12.03.Ink). Afterwards the marked narrative shifts were compared to those, defined in the prestudy by Klann and Huber (2011).

In both presentation modes the participants first received all four stories without any further assignment. This was to make them familiar with the story. Afterwards

⁸ The cognition test is done for as well the patients as the control participants. For the control participants, it serves as a tool to exclude cognitive impairments, whereas for the patients, it is done for documentation and interpretation means. Patients are not excluded because of weak performances on the MMSE.

⁹ The exact instruction was (in German): "Bitte drücken Sie die linke Maustaste, wenn etwas neues beginnt." This instruction could be extended by: „Es gibt keine richtigen oder falschen Antworten. Drücken Sie einfach immer, wenn Sie das Gefühl haben, es beginnt gerade oder gleich ein neuer Abschnitt in der Geschichte, so ähnlich wie Kapitel in einem Buch“.

participants were given the instruction mentioned before. If the instruction was not clear to a participant, an extended version was given. Nobody got any further explanations, because it was not intended to generate metaknowledge about narrative shifts and thus prime the participants on what to look for (e.g. changes in person, time, location etc.).

Since the patients were recruited from different hospitals, the meetings could not always be in the same location. Some patients and matched controls had to be assessed in their home situation. However, the meetings always were in similar, quiet rooms and were done at the same time of the day (in the morning). Additionally, the same researcher was present at all meetings and used the same laptop and material with every participant.

2.4. Variables

The dependent variable in this study is the reaction of the patients, so to say the unaware detection of narrative shifts (“something new happening”). Thus the (amount of the) changes in narrative events that the participants indicate. The independent variables are localization of brain damage (left, right, none), presentation mode (text, silent movie), sex, age and education. Even though the research question regards the influence of the presentation mode and localization of brain damage, the other variables have to be included, since they could influence the results. In bigger (patient) groups, subgroups regarding age and sex should be composed in order to make an ANOVA (analysis of variance) graspable.

2.5. Design

Since the patient-groups are being compared to each other this study has a between-subject design. Due to the small number of participants, this study is designed as a multiple single case study. There is the same approach to all participants, thus this study just addresses the differences in narrative comprehension of the participants.

2.6. *(Statistical) Analysis*

Due to the small amount of participants, a quantitative, statistical, analysis was not possible. The detection of narrative shifts had thus to be compared descriptively.

In order to check for the comparability of the data, the four control participants of this study were compared to the reference sample (prestudy)¹⁰. Afterwards the research questions were handled, addressing the comparison between the patients with left hemisphere brain damage (LHD) and right hemisphere brain damage (RHD) in the non-verbal presentation mode. First of all the LHD patients were compared to their control participants (LHD C). Afterwards the LHD patients were compared to the reference sample (prestudy). The same was done for the RHD patients, comparing them to their controls (RHD C) and the reference sample. After that, the LHD patients were compared to the RHD patients directly. For the comparison of these patient groups in the verbal presentation mode, the same method was used.

Next, differences within the LHD and RHD patients in the identification of (possible) shifts between the verbal and non-verbal presentation mode were investigated.

In order to being able to perform the described analyses, the obtained results of all the participants had to be gathered in a designated manner. For each story and presentation mode, tables were made in which all the button presses of each participant were noted to the split second. In a second step, these tables were searched for clustered responses within time windows of ten seconds¹¹. A response was regarded as clustered, when at least half of the participants (thus four participants) pressed the button in that time window. Afterwards a

¹⁰ In the prestudy, the actual narrative shifts were regarded shifts when at least 14 of the 20 participants responded to the situation. This is due to a 90% binominal distribution (Klann & Huber, 2011). In the n=8 "group", there are no actual narrative shifts. Due to the small amount of participants one can only talk of (possible) shifts. When at least 4 participants (thus at least 50% of the participants) responded to one (clustered in windows of max. 10 sec.) moment in the story, it was regarded as a (possible) shift.

¹¹ The prestudy of Klann and Huber (2011) showed that ten seconds are a reliable time window for narrative shifts.

propositional analysis was done for the clustered responses. For each window of response, the propositional content of the story (for each presentation mode) was noted. The time windows for the actual narrative shifts of the prestudy were also included in this analysis, noting these propositional contents as well. When the actual and possible shifts matched, windows could be bigger than ten seconds, due to the summarization of two windows (from the $n=8$ and the prestudy). This resulted in eight basic tables that were used for all the analyses in the following chapter. These tables can be found in appendix 1.

It is important to mention once again that with the obtained information no conclusions can be drawn about differences between groups. Also the referral of “groups” is not completely applicable in this study, due to the small amount of participants. One can only give information about the individual participants and in some cases tendencies for the “groups”. The whole study has to be repeated with a bigger amount of participants in order to support or rejected the results of the current study.

3. RESULTS

In the following chapter the results of the descriptive analysis will be presented (the raw data on which these analyses are based can be found in appendix 1).

To check out the accuracy of the actual study, foremost data of the four control participants was compared to the results of the prestudy (Klann & Huber, 2011). Since the prestudy has been replicated with high significance (overall n=80, with n=40 in German and n=40 in Finnish), it served as norm data. Here it has to be kept in mind that it included younger participants only (non-verbal presentation mode: n=20, age range: 19-27; median: 23; verbal presentation mode: n=20, age range: 21-41 years of age, median: 27; in the present study it ranged from 47 to 75 years with a median of 55.5 years of age). Thus, if the results of the actual four controls differ from the prestudy data, this may be interpreted as (a) age difference related, or (b) a potentially erroneous conduction of the current study.

The four control patients deviated from the data compiled in the prestudy in terms of the amount of (possible) shifts that they detected¹² (c.f. table 4). Also the (possible) shifts that were detected by the control participants did not concur with the actual shifts from the prestudy. In just one case (mall – film) the amount of consensuses was comparable to the total amount of shifts from the prestudy. In the other stories / presentation modes, there were one to three actual shifts that were not detected by the current control participants.

¹² In order to compare the control participants to the participants from the prestudy, shifts were regarded as (possible) shifts when at least three of the four control participants responded to the situation. This way, at all times, at least one participant per “group” (LHD C and RHD C) was included in this sample.

Story - condition	Total shifts Controls	Total shifts prestudy	Amount of consensuses
Mall - film	17	8	8
Mall - text	14	8	6
Pool - film	6	3	2
Pool - text	14	4	3
Barber - film	9	8	5
Barber - text	14	8	7
Queen - film	12	6	4
Queen - text	21	7	5

Table 4: Total amounts of shifts and consensuses between the control participants and the comparison sample (prestudy)

As stated above, the deviant results of healthy control participants as compared to the reference data from the prestudy might rely on a general problem with the study, but might also be explained by age differences between the participants in both studies. Therefore this has to be kept in mind while interpreting the results of the patient data. Nevertheless, this data will be compared to the patient data. Additionally, patient data is compared to the results of the prestudy.

The first question of this study addresses the comparison in behavior in LHD versus RHD patients in the *non-verbal presentation mode*. Therefore, the respective data is collated. Beforehand, each “group” of patients is compared to its controls and additionally ranked in the prestudy data.

The LHD patients had nine shifts in the non-verbal presentation mode, distributed over the different stories with one (possible) shift in “Mall”, two (possible) shifts in “Pool”, four (possible) shifts in “Barber” and two (possible) shifts in “Queen”. Overall they differ from their respective controls in the amount of detected (possible) shifts. The healthy control participants detect up to 16 more (possible) shifts per story, thus most of the (possible) shifts were detected by the control participants only. In all stories but “Barber” the amount of consensuses included all (possible) shifts detected by the LHD patients. Overall there is an overlap between the “groups” in 16.7% of the (possible) shifts, ranging from 5.9% (Mall) to 25% (Barber) (c.f. table 5).

Story	Total shifts LHD	Total shifts LHD C	Amount of consensuses	Percentage of correctly detected shifts by LHD
Mall	1	17	1	5.9%
Pool	2	9	2	22.2%
Barber	4	12	3	25%
Queen	2	10	2	20%
Total	9	48	8	16.7%

Table 5: Comparison of the LHD patients and their controls (LHD C) in the non-verbal presentation mode

When comparing the LHD patients to the reference data from the prestudy, it gets obvious that the LHD patients did not detect less (possible) shifts in the non-verbal presentation mode, but that these shift do not correspond to the actual narrative shifts detected in the prestudy. Only in the story “Barber” there is consensus for one shift (12.5%), whereas in the other stories (“Mall”, “Pool” and “Queen”), there is none (0%). Overall the LHD patients only detected 4% of the actual narrative shifts from the prestudy (c.f. table 6).

Story	Total shifts LHD	Total shifts prestudy	Amount of consensuses	Percentage of correctly detected shifts by LHD
Mall	1	8	0	0%
Pool	2	3	0	0%
Barber	4	8	1	12.5%
Queen	2	6	0	0%
Total	9	25	1	4%

Table 6: Comparison of the LHD patients to the reference data (prestudy) in the non-verbal presentation mode

The RHD patients had 47 shifts in the non-verbal presentation mode, distributed over the different stories with 15 (possible) shifts in “Mall”, nine (possible) shifts in “Pool”, 11 (possible) shifts in “Barber” and 12 (possible) shifts in “Queen”. Overall the difference between the RHD patients and their control participants (RHD C) is very small. For the story “Mall” the RHD patients did not detect shift numbers 7 and 17 and in story “Pool” they missed shift number 2 (c.f. table 9). Thus, most (possible) shifts detected by the RHD C participants were detected by the RHD patients as well. The overall overlap in the detection of (possible) shifts

between the RHD patients and their controls is 94%, ranging from 88.2% (Mall) to 100% (Barber & Queen) (c.f. table 7).

Story	Total shifts RHD	Total shifts RHD C	Amount of consensuses	Percentage of correctly detected shifts by RHD
Mall	15	17	15	88.2%
Pool	9	10	9	90%
Barber	11	11	11	100%
Queen	12	12	12	100%
Total	47	50	47	94%

Table 7: Comparison of RHD patients and their controls (RHD C) in the non-verbal presentation mode

Comparing the RHD patients to the reference data from the prestudy in the non-verbal presentation mode, the amount of consensus is still relatively high but yet lower than compared to the control participants. Overall the RHD patients detected more (possible) shifts than the prestudy, but missed six. In the story “Mall” they missed shift number 7, in “Pool” none, in “Barber” numbers 7, 12 and 14 and in the story “Queen” the RHD patients did not identify shift numbers 2 and 8 (c.f. table 9). The total percentage of correctly identified shifts by the RHD patients is 76% ranging from 62.5% in “Barber” to 100% in “Pool” (c.f. table 8).

Story	Total shifts RHD	Total shifts prestudy	Amount of consensuses	Percentage of correctly detected shifts by RHD
Mall	15	8	7	87.5%
Pool	9	3	3	100%
Barber	11	8	5	62.5%
Queen	12	6	4	66.7%
Total	47	25	19	76%

Table 8: Comparison of the RHD patients to the reference data (prestudy) in the non-verbal presentation mode

Story	Shiftnr. not identified in RHD but in RHD C	Total	Shiftnr. not identified in RHD but in prestudy	Total
Mall	7, 17	2	7	1
Pool	2	1	none	0
Barber	none	0	7, 12, 14	3
Queen	none	0	2, 8	2

Table 9: Shift numbers not identified by the RHD patients but by their control participants (RHD C) respectively the reference group (prestudy) in the non-verbal presentation mode¹³

When comparing the LHD patients directly to the RHD patients one can see that the LHD patients detected less (possible) shifts than the RHD patients (c.f. table 10). Overall the LHD patients detected nine (possible) shifts in the non-verbal presentation mode whereas the RHD patients detected 47. Thus, 19.2% of the shifts detected by the RHD patients were detected by the LHD patients as well with percentages ranging from 6.7% in “Mall” to 36.4% in “Barber”. Even though there is a big difference in amount of (possible) shifts, the amount of consensuses overall in the non-verbal presentation mode is equal to the (possible) shifts detected by the LHD patients. All of the shifts that the LHD patients detected were thus also detected by the RHD patients, but not the other way round.

Story	Total shifts LHD	Total shifts RHD	Amount of consensuses	Percentage of RHD shifts detected by LHD patients
Mall	1	15	1	6.7%
Pool	2	9	2	22.2%
Barber	4	11	4	36.4%
Queen	2	12	3	25%
Total	9	47	9	19.2%

Table 10: Comparison of LHD and RHD patients in the non-verbal presentation mode

Overall the LHD patients seemed to identify less (possible) shifts than the RHD patients in the non-verbal presentation mode. They did not detect any different shifts than the RHD patients, though.

¹³ The raw data, with the shiftnumbers included, can be found in appendix 1

The second question concerned the comparison between shifts from the LHD versus RHD patients in the *verbal presentation* mode. Again, the patient “groups” are primarily compared to their controls and the reference group, before they are contrasted directly. The LHD patients detected 20 (possible) shifts in the verbal presentation mode, distributed over the different stories with four (possible) shifts in “Mall”, three in “Pool”, seven in “Barber” and six in “Queen”. The difference between the control participants and the LHD patients lies mainly in the amount of detected (possible) shifts. Per story the difference varies from 11 (Mall, Pool) to 16 (Barber) more (possible) shifts for the LHD C participants. Only for the story “Pool” the amount of consensuses is equal to the shifts of the LHD participants. In the other stories the LHD participants identified one different shift than their controls. Overall, the overlap between the LHD patients and their controls is 25%, ranging from 21.4% (Mall, Pool) to 27.8% (Queen) (c.f. table 11).

Story	Total shifts LHD	Total shifts LHD C	Amount of consensuses	Percentage of correctly detected shifts by LHD
Mall	4	14	3	21.4%
Pool	3	14	3	21.4%
Barber	7	22	6	27.3%
Queen	6	18	5	27.8%
Total	20	68	17	25%

Table 11: Comparison of the LHD patients and their controls (LHD C) in the verbal presentation mode

Comparing the LHD patients to the reference group (prestudy) one cannot see big differences in the amount of (possible) shifts the “groups” detected in the verbal presentation mode. The LHD patients identified 20 (possible) shifts, whereas the prestudy identified 27 actual shifts. The amount of consensuses differs widely between the stories, ranging from zero to four consensuses. This can also be seen in the percentage of correctly identified shifts by the LHD patients. Overall they identified 29.6% of the actual narrative shifts, ranging from 0% (Pool) to 50% (Mall). The highest consensus could thus be found in the story “Mall”, whereas the lowest or no consensus could be found in “Pool” (c.f. table 12).

Story	Total shifts LHD	Total shifts prestudy	Amount of consensuses	Percentage of correctly detected shifts by LHD
Mall	4	8	4	50%
Pool	3	4	0	0%
Barber	7	8	3	37.5%
Queen	6	7	1	14.3%
Total	20	27	8	29.6%

Table 12: Comparison of the LHD patients to the reference data (prestudy) in the verbal presentation mode

In the verbal presentation mode, the RHD patients overall detected 70 (possible) shifts, distributed over the different stories with 15 (possible) shifts in “Mall”, 14 in “Pool”, 19 in “Barber” and 22 in “Queen”. The difference for this presentation mode is very small between the RHD patients and their control participants (RHD C). Only in the story “Queen” the RHD patients failed to identify two (possible) shifts detected by the RHD C participants, in particular shift numbers 4 and 10 (c.f. table 15). Almost all shifts identified by the control participants were thus identified by the RHD patients as well. Overall there is an overlap of 97.2% in the detection of (possible) shifts between the RHD patients and their controls, ranging from 91.7% (Queen) to 100% (Mall, Pool and Barber) (c.f. table 13).

Story	Total shifts RHD	Total shifts RHD C	Amount of consensuses	Percentage of correctly detected shifts by RHD
Mall	15	15	15	100%
Pool	14	14	14	100%
Barber	19	19	19	100%
Queen	22	24	22	91.7%
Total	70	72	70	97.2%

Table 13: Comparison of RHD patients and their controls (RHD C) in the verbal presentation mode

Comparing the RHD patients in the verbal presentation mode to the reference group (prestudy), there is still a relatively high amount of consensus, but it is lower than compared to the control participants. The RHD patients overall detected more (possible) shifts than the reference group, but missed four. In the story “Mall” they missed shift number 3, in “Pool” number 13, in “Barber” none and in the story “Queen” the RHD patients did not identify shift numbers 4 and 21 (c.f. table 15).

The total percentage of correctly identified actual narrative shifts by the RHD patients is 85.2% ranging from 71.4% in “Queen” to 100% in “Barber” (c.f. table 14).

Story	Total shifts RHD	Total shifts prestudy	Amount of consensuses	Percentage of correctly detected shifts by RHD
Mall	15	8	7	87.5%
Pool	14	4	3	75%
Barber	19	8	8	100%
Queen	22	7	5	71.4%
Total	70	27	23	85.2%

Table 14: Comparison of the RHD patients to the reference data (prestudy) in the verbal presentation mode

Story	Shiftnr. not identified in RHD but in RHD C	Total	Shiftnr. not identified in RHD but in prestudy	Total
Mall	none	0	3	1
Pool	none	0	13	1
Barber	none	0	none	0
Queen	4, 10	2	4, 21	2

Table 15: Shift numbers not identified by the RHD patients but by their control participants (RHD C) respectively the reference group (prestudy) in the verbal presentation mode

Comparing the LHD directly to the RHD patients in the verbal presentation mode, it gets obvious that the LHD patients detect less (possible) shifts than the RHD patients (20 vs. 70 (possible) shifts). The amount of consensuses between the LHD and the RHD patients is almost equal to the detected shifts within the LHD patients, with except for shift numbers 4 and 10 in the story “Queen”. Here the LHD patients identified two (possible) shifts which the RHD patients did not identify. Overall the LHD patients identified 25.7% of the (possible) shifts detected by the RHD patients, ranging from 18.2% in Queen to 36.8% in Barber (c.f. table 16).

Story	Total shifts LHD	Total shifts RHD	Amount of consensuses	Percentage of RHD shifts detected by LHD patients
Mall	4	15	4	26.7%
Pool	3	14	3	21.4%
Barber	7	19	7	36.8%
Queen	6	22	4	18.2%
Total	20	70	18	25.7%

Table 16: Comparison of LHD and RHD patients in the verbal presentation mode

In the verbal presentation mode, the LHD patients seemed to overall identify less (possible) shifts than the RHD patients. They did detect two different shifts than the RHD patients in one story, though.

Overall, there seems to be a difference between the LHD and RHD patients in both presentation modes, with the LHD patients identifying fewer (possible) shifts than the RHD patients. Comparing the non-verbal to the verbal presentation mode, there seems to be an advantage in both “groups”, but especially in the LHD patients, for the verbal presentation mode.

In order to investigate if there is a difference within LHD patients in the identification of narrative shifts between the verbal and non-verbal presentation mode (third question), the results of both presentation modes are compared within these patients. Patient 1 (LHD 1) identified one shift in the non-verbal and eight shifts in the verbal presentation mode. Patient 2 (LHD 2) identified eight shifts in the non-verbal and 13 shifts in the verbal presentation mode. In the respective control participants the proportion of shifts was 25 for non-verbal and 40 for the verbal presentation mode for LHD C1 and 47 in the non-verbal and 62 in the verbal presentation mode for LHD C2 (c.f. table 17). This converges from the patient data, regarding the trend in favor for the verbal presentation mode.

When looking at the stories themselves, there do not seem to be any big differences in performance. Control participants LHD C 1’s performance did differ between the stories, but this was visible in both presentation modes. Only in the

verbal presentation mode for the story “Queen” this patient had an outlier, dropping suddenly to a very low amount of detected shifts (c.f. table 17).

Thus, for the LHD patients as well as their control participants there seems to be an advantage of the verbal presentation mode.

Story	Non-verbal presentation mode				Verbal presentation mode			
	LHD 1	LHD 2	LHD C 1	LHD C 2	LHD 1	LHD 2	LHD C 1	LHD C 2
Mall	0	1	10	17	2	3	10	14
Pool	0	2	3	9	1	2	14	14
Barber	1	3	4	10	3	4	14	13
Queen	0	2	8	11	2	4	2	21
Total	1	8	25	47	8	13	40	62

Table 17: Comparison of presentation modes and stories per patient in the LHD “group” and their controls

Regarding the identification of (possible) shifts in the RHD patients, Patient 1 (RHD 1) detected seven in the non-verbal and 27 in the verbal presentation mode. Patient 2 (RHD 2) identified 46 (possible) shifts in the non-verbal and 65 in the verbal presentation mode. Their respective control participants identified 39 (possible) shifts in the non-verbal and 57 in the verbal presentation mode (RHD C 1) and 50 in the verbal and 68 in the non-verbal presentation mode (RHD C 2) (c.f. table 18). The control participants as well as the RHD patients thus show an advantage for the verbal presentation mode.

When looking at the stories themselves, there is one story that does not converge with this finding. In the story “Mall”, all the participants detected more (possible) shifts in the non-verbal presentation mode compared to the verbal presentation mode, except from RHD 1 who detected an equal amount of shifts (c.f. table 18). Overall, the RHD patients and their control participants showed a favor for the verbal presentation mode as well.

Story	Non-verbal presentation mode				Verbal presentation mode			
	RHD 1	RHD 2	RHD C 1	RHD C 2	RHD 1	RHD 2	RHD C 1	RHD C 2
Mall	3	15	14	17	3	14	10	15
Pool	1	9	6	10	6	14	10	14
Barber	1	11	9	11	8	18	13	16
Queen	2	11	10	12	10	19	24	23
Total	7	46	39	50	27	65	57	68

Table 18: Comparison of presentation modes and stories per patient in the RHD “group” and their controls

The results show that the control participants from this study deferred from the reference data from the prestudy in terms of the amount of (possible) shifts detected, with the current participants detecting more (possible) shifts and not all of the actual narrative shifts from the prestudy. Furthermore, the LHD patients seemed to identify less (possible) shifts than their control participants, the reference sample (prestudy) and the RHD patients in both the non-verbal and verbal presentation mode. In both patient “groups”, there seems to be an advantage for the verbal presentation mode, in which all of the participants of this study detected more (possible) shifts compared to the non-verbal presentation mode.

4. DISCUSSION

In the following, the method used for this study will be discussed first. Thereupon the results presented in chapter 3 will be reviewed in the context of the literature and problems regarding the results will be discussed. At the end of this chapter the clinical relevance of this study will be discussed.

4.1. Discussion of the method

The original method for this study included five patients with a lesion in the left and five patients with a lesion in the right hemisphere. Due to problems in finding the patients and a lack of time in the completion phase, fewer patients could be included. Therefore the statistical analysis could not take place as planned, since there were too little participants. Furthermore, due to the small amount of participants, a randomized assignation of the order in which the study's presentation modes were presented, could not take place. All participants listened to the stories first and watched the movies in the second meeting. This could have an influence on the results, since for some patients the verbal presentation mode might have had an advantage over the non-verbal presentation mode. It also got obvious that the participants did pay more attention to the stories, compared to the film. All participants detected more (possible) shifts in the verbal presentation mode (text) than in the non-verbal presentation mode (film) and seemed to be more interested as well. This does not have to mean that they found the stories more interesting, only that after listening to and watching a lot of stories / films, they might have lost interest or got tired. Additionally, the patients overall pressed the button fewer times in the non-verbal presentation mode (film). It has to be investigated whether a randomized assignation of the order of presentation mode will change this or if the participants actually do perform better on the verbal presentation mode (text).

Localizing the brain damage in patients with a lesion in the left hemisphere was easier than for patients with a lesion in the right hemisphere. Patients with left hemisphere brain damage presented with non-fluent aphasia and were controlled

for additional disorders. Also left hemispheric brain damaged patients were recruited from the University hospital of the RWTH Aachen University, where a lot of information on the patients were given. The patients with right hemisphere brain damaged were recruited from a rehabilitation center in Meerbusch ("St. Mauritius Therapieklinik"). In this rehabilitation center, the patients were not assessed by means of localization but function. Therefore the exact localization of the brain damage was less clear in the right hemisphere brain damaged patients. In order to be approximately in the homologous areas to the left hemisphere, patients with symptoms of frontal right hemisphere brain damage were included. The information about these patients was, compared to the left hemispheric brain damaged patients, rather brief. It could thus be possible that the few patients included in this study, were not perfectly comparable, which could have an influence on the results.

An important aspect that might have had an influence on the results of this study is that almost all the participants seemed to have trouble understanding the instruction. This might be a reason for why especially the healthy control participants and part of the RHD "group" had a lot of button presses. The instruction (given in the method) might have been too superficial for this group, even though it seemed to be a proper instruction in the prestudy. Thus, there might be a difference in the comprehension of this instruction between younger and older people. In order to investigate whether the instruction was insufficient, several instructions with increasing informative content have to be compared for this age group. Regarding patients / participant specific results, it could be possible that older people do not actually have difficulties with the comprehension of the instruction but that they detect different and more (possible) narrative shifts than younger people. The building of situation models could thus be different from that for younger people, which would dismantle the norm data of young people as a reference in this study. A comparison of only healthy people in both age groups would be necessary in order to check for this aspect.

The results for the right hemisphere damaged patients (RHD) might have been influenced by just one of the two patients. Patient RHD 2 seemed to behave very similar to the control participants and did not give the impression to be impaired

by his brain damage regarding his cognitive functioning. He is the reason for the high amount of consensus between the RHD patients and their control participants. Patient RHD 1 behaved differently and detected less (possible) shifts, accounting for a maximum of one to 10 (possible) shifts per story.

Within the LHD “group” both patients had non-fluent aphasias, with the comprehension being relatively spared. However it might be possible that they did not completely understand the instruction and therefore detected less (possible) shifts. A comparison with patients with fluent aphasia, non-fluent aphasia and a control group would be important in order to investigate the influence of comprehension problems on the study.

4.2. Discussion of the results

Once again, before proceeding, it has to be mentioned that the results of this study are not representative and conclusive, due to the small amount of participants (per “group”).

The deviation from the control participants of the current study to the reference sample (prestudy) from the prestudy is an important aspect to discuss. Radvansky et al (2003) looked for age differences in narrative comprehension, focusing especially on the updating processes of situation models. In their study they found effects representing the update of respective models, but these were not influenced by age. According to Radvansky and Dijkstra (2007) deficiencies in the surface form and the processing of textbases are found to be age-related, whereas the construction and updating of situation models are not. If these results are true, the findings in the current study might rather be due to the methodological deficiencies described previously than to difference in narrative comprehension in young and old people.

The patients with left hemisphere brain damage (LHD) overall identified less (possible) shifts than their control participants and the reference sample in both presentation modes. Patients with LHD were supposed to have a lesion in Broca’s area. Federenko et al. (2012) stated that in Broca’s area there are two sub regions. One of these sub regions is rather language-specific whereas the other holds a

wider variety of tasks and content domains, such as the building of hierarchical structure and aspects of actions processing. It might be possible that these domain-general functions in Broca's area in the left hemisphere constitute to the findings in the current study, with patients with LHD and thus aphasia, identifying less (possible) shifts than healthy people. If this is not true, methodological shortcomings, e.g. the patient recruitment, might play a role in these findings as well.

In the current study, the right hemisphere damaged patients (RHD) showed similar behavior in the identification of (possible) narrative shifts as the control participants and the reference sample (prestudy) in both presentation modes. This is not in view with the findings in the literature. Especially in the right frontal hemisphere, a lot of functions that are important for narrative comprehension can be found. According to Marini (2012) it is involved in the organization of information in narrative discourse. Furthermore it is involved in the integration of new information into an existing context (e.g. Robertson et al., 2002; St. George et al., 1999; Bottini et al., 1994). Ferstl et al. (2005) reported that patients with right frontal hemisphere brain damage showed a lower level of informativeness than healthy people. As described previously, the exact localization of brain damage for the RHD patients was difficult due to the fact that the revalidation center assessed the patients by means of functions rather than localization. It might thus be possible that the RHD patients in the current study did not actually have a lesion in Broca's homologue and could therefore not ideally represent this patient group.

According to the hypothesis, patients with left hemisphere brain damage (LHD) were thought to have problems with the comprehension of the verbal presentation mode but not with the non-verbal presentation mode. This is due to the fact that the included patients with LHD had non-fluent aphasia, in which comprehension is relatively spared, but is almost never completely intact (e.g. Johnson & Cannizzaro, 2009; Bastiaanse & van Zonneveld, 2006). Therefore in the comprehension of rather complex (verbally presented) narratives, patients with non-fluent aphasia are thought to have some trouble understanding the whole story. Contrary, if problems in the verbal presentation mode can only be addressed to the aphasia, the LHD patients should not have any difficulty with the non-verbal presentation mode. Fazio et al. (2009) found that Broca's area plays a role in the understanding

of actions of other individuals. According to them, patients with frontal, non-fluent aphasia, show impairment in the ability of correctly encoding observed human actions. In their study, they used short movies of human actions. The LHD patients in the current study might have had problems with encoding of human actions as well, manifesting itself more in the non-verbal than in the verbal presentation mode. This would be in view of the findings by Fazio et al. (2009). The verbal presentation mode might leave less room for interpretation and gives more information than the non-verbal presentation mode.

The RHD patients in the current study showed an advantage for the verbal compared to the non-verbal presentation mode as well. In view of the finding in the literature, it was expected that patients with right hemisphere brain damage would show difficulties in both presentation modes, with no differences between the presentation modes. This is due to the fact, that, as mentioned previously, the right frontal hemisphere holds a lot of domain-general, modality-independent functions used for narrative comprehension and the building of situation models. If these domain-general functions are impaired, this should have an influence on the building of situation models itself, regardless of the presentation mode. Until now research did not investigate possible differences in narrative comprehension or situation model building between a verbal and non-verbal presentation mode, so these findings cannot be hold against the literature. Due to the methodology of this study with two participants per “group”, one participant has a great share in the results for a whole “group”, which is possibly the case in this study.

Influences of individual participants

In the current study individual participants might have influenced the results of a whole “group” and thus the results. This is possibly the case for patient RHD 2. As could be seen in the results, this patient behaved comparable to his control participant regarding the identification of (possible) shifts. Therefore he had a great share of the (possible) shifts detected by the RHD “group”, which could give a wrong impression of the results regarding the patients with right hemisphere brain damage. Patient RHD 1 did show different results, e.g. identifying fewer

(possible) shifts in both presentation modes, but due to RHD 2's behavior, this patient rather represents the "group" of RHD patients than patient RHD 1.

All of the discussion points mentioned above, have to be evaluated in a repetition of this study with a greater amount of participants per group, a check for a more detailed vs. the current instruction and a better and more specific localization of brain damage.

Reference to the research questions and hypotheses

With the obtained results no (direct) answer to the main research question ("Is there a difference in narrative comprehension in patients with left hemisphere brain damage and patients with right hemisphere brain damage?") can be given. This is especially due to the fact that within the RHD "group" one participant (RHD 2) almost acted like the control participants. Within a "group" of two people that one participant therefore has a high share of the results for the RHD patients. Nevertheless, since RHD 1 did also show better results than the LHD patients in both presentation modes, a trend towards the RHD patients having better narrative comprehension than the LHD patients, can be seen.

Regarding the sub-questions, the first two questions ("Is there a difference in the identification of narrative shifts between patients with left and right hemisphere damage in the non-verbal presentation mode (1) / in the verbal presentation mode (2)??") cannot be answered either due to the same reason. The third and fourth question ("Is there a difference within patients with left hemisphere damage (3) / right hemisphere damage (4) in the identification of narrative shifts between the verbal and non-verbal presentation mode?") can be addressed with the results of this study, giving indications of a trend. Both "groups", the LHD as well as RHD patients showed a (slight) advantage for the verbal compared to the non-verbal presentation mode, even though the LHD C participants showed a slight advantage for the non-verbal presentation mode. Since these results cannot be checked for statically, no hypotheses can be rejected or accepted. The obtained results however do not seem to support the researcher's expectations (LHD: non-verbal > verbal presentation mode, RHD: non-verbal = verbal presentation mode).

4.3. *Clinical relevance*

Fundamental research is a very important field of research, since the underlying processes of a phenomenon are comprehended step by step. Especially in the field of speech and language therapy fundamental research should be just as important as research for diagnostic and therapy material. This is because the etiology of a lot of disorders are not yet completely understood, which it should be if one tries to help people with disorders.

Narrative shifts are a fundamental process of narrative comprehension and have therefore to be further investigated. Knowledge about narrative shifts could especially be applicable within the diagnosis and therapy of patients with problems in narrative comprehension. It is already known that patients with for example right hemispheric brain lesions can show poor narrative comprehension (Lojek-Osiejuk, 1996), but it is not yet known what the underlying problem for this is. Since problems in narrative comprehension (for patients with right hemisphere brain damage) often only present themselves in everyday conversations, it is frequently not recognized until the patient is already home. Therefore it is important to gain more insight in these problems and to being able to detect these problems earlier in the process of rehabilitation.

In order to understand the whole process of narrative shifts or comprehension, it is important to investigate the narrative shift itself with behavioral studies as well as to look at the neurological organization and the functions included in narrative shifts with imaging studies. Only if both aspects of narrative shifts are investigated, practical relevance for the speech and language therapy can be established.

The current study tried to investigate underlying problems for narrative comprehension in a behavioral study in two patients “groups”: patients with left and patients with right hemisphere brain damage. Even though there were several problems regarding the method and results of this study, in principle it is of high clinical relevance, in terms of therapy. It is not useful to give RHD patients training in language comprehension to improve story comprehension, if the theoretical assumption of a language-independent disorder in situation model building is right. When executed in an adjusted manner and accompanied by an imaging study of the underlying processes in healthy subjects as well as in chronic patients, it

could give insight in the anatomical distribution of functions involved in story comprehension over the two hemispheres and hence improve therapeutical interventions for each kind of disturbance manifesting itself in story comprehension deficits after unilateral stroke.

5. SUMMARY AND CONCLUSION

The aim of this study was to investigate possible differences between patients with left hemisphere brain damage (LHD) and patients with right hemisphere brain damage (RHD). In order to analyze this aim, the basic assumption of the situation model and therein the importance of narrative shifts was taken as the basis. For the reception of narratives, the incoming information is structured online, with related information being clustered as macropropositions. Mental models of the situation, situation models, emerge and are filled with new information as long as the information is coherent. Whenever integration is not possible because there is no direct connection, or even a contradiction, a new situation model has to emerge. This mainly happens when there is a change of main character, location, time, action or emotion. The change from one situation model to another is called narrative shift. Narrative shifts thus play a big role in the segmentation of a story and is a process that is thought to be independent from the modality. Even though the perception of a narrative shift can vary individually, there are obligatory shifts that are identified by at least 90% of the healthy people.

Until now there have not been any studies regarding the building of situation models and thus the detection of narrative shifts in different modalities in patients with left and/or right hemisphere brain damage.

The current study investigated the detection of narrative shifts in two patients with left (frontal) hemisphere brain damage, resulting in non-fluent aphasia, and two patients with right (frontal) hemisphere brain damage. These patients were compared to individually matched, healthy control participants and to a comparison sample of 20 participants from the prestudy of Klann and Huber (2011). All participants watched four silent movies from the *Mr. Bean* series (non-verbal presentation mode) and listened to four matching stories (verbal presentation mode). In both presentation modes the participants had to mark the, by them felt, narrative shifts. The detected (possible) shifts of this study were compared to the actual narrative shifts from the prestudy for the total “group”, the patients with left hemisphere brain damage and patients with right hemisphere

brain damage. Also differences between the two presentation modes (verbal vs. non-verbal) were investigated for each “group”.

The constructed hypotheses arose from studies regarding the building of situation models and narrative shifts in different modalities, as well as studies about characteristics from left and right (frontal) hemisphere brain damage regarding situations models and narrative shifts. The current study could neither confirm nor reject the hypotheses because of several aspects: no conclusions could be drawn on the basis of two patients per “group”, the patients within one “group” differed too much from each other and the instruction seemed to be insufficient for the participants. Due to these aspects, no conclusions can be drawn about possible differences between patients with left and patients with right hemisphere brain damage in the building of situation models, the detection of narrative shifts and thus narrative comprehension itself. Possible trends in this study could show that patients with left hemisphere brain damage might detect less (possible) shifts than patients with right hemisphere brain damage. The verbal presentation mode seemed to have a (slight) advantage compared to the non-verbal presentation mode.

6. OUTLOOK

For future studies it is important to deal with the problems that arose in the current study. Since it is an important topic, it is also important to replicate the study in a bigger manner. Future studies should further focus on integrating the information about situation models and narrative shifts in patients with left and right hemisphere brain damage into the diagnosis and therapy of narrative comprehension for speech and language therapists.

It might be interesting for the reader to know that the researcher of this study will proceed to work with this topic. If everything works out, the researcher will start working on her Ph.D. at the University hospital of the RWTH Aachen University starting in begin 2014. The current study will then be replicated with a greater amount of participants and the inclusion of a fMRI examination in order to investigate visible differences between patients with left and patients with right hemisphere brain damage in the building of situation models and thus in narrative comprehension. Also it is important to know whether different brain areas are activated for these patients compared to healthy people.

If there are any questions regarding this topic, the researcher will happily answer them. Please just send an email to laurafuss@gmail.com and you will receive a response as soon as possible.

REFERENCES

Ash, S., Xie, S.X., Goldmann Gross, R., Dreyfuss, M., Boller, A., Camp, E., Morgan, B., O'Shea, J., Grossman, M. (2012). The Organization and Anatomy of Narrative Comprehension and Expression in Lewy Body Spectrum Disorders. *Neuropsychology*, 26, 3, 368-384

Bastiaanse, R. & van Zonneveld, R. (2006). Comprehension of passives in Broca's aphasia. *Brain and Language*, 96, 135-142

Beaugrande, de, R.A., Dressler, W.U. (1981). *Einführung in die Textlinguistik*. Tübingen: Niemeyer

Bottini, G., Corcoran, R., Sterzi, R., Paulesu, E., Schenone, P., Scarpa, P., Frackowiak, R.S.J. & Frith, C.D. (1994). The role of the right hemisphere in the interpretation of figurative aspects of language: A positron emission tomography study. *Brain*, 117, 1241-1253

Coté, H., Payer, M., Giroux, F., Joannette, Y. (2007). Towards a description of clinical communication impairment profiles following right-hemisphere damage. *Aphasiology*, 21, 739-749

Cranenburgh, van, B. (2004). *Neurowetenschappen, een overzicht (4^e oplage)*. Maarssen: Elsevier gezondheidszorg

Dharmaperwira-Prins, R., Maas, W. (1998). *Afasie - beschrijving, onderzoken, behandeling (8^e druk)*. Lisse: Swets & Zeitlinger Publishers

Dijk, van, T.A. (1995). On Macrostructures, Mental Modes, and Other Inventions: A Brief Personal History of the Kintsch-van Dijk Theory. In: Charles A. Weaver III, Suzanne Mannes, and Charles Fletcher (Eds.). *Discourse Comprehension: Essays in Honor of Walter Kintsch*. Hillsdale, NJ: Lawrence Erlbaum Associates: Chapter 20

Fazio, P., Cantagallo, A., Craighero, L., D'Ausilio, A., Roy, A.C., Pozzo, T., Calzolari, F., Granieri, E. & Fadiga, L. (2009). Encoding of human action in Broca's area. *Brain*, 123, 1980-1988

Federenko, E., Duncan, J., Kanwisher, N. (2012). Language-Selective and Domain-General Regions Lie Side by Side within Broca's Area. *Current Biology*, 22, 2059-2062

Ferstl, E., Rinck, M., Cramon, von, D.Y. (2005). Emotional and Temporal Aspects of Situation Model Processing during Text Comprehension: An Event-Related fMRI Study. *Journal of Cognitive Neuroscience*, 17, 5, 724-739

Ferstl, E.C. and Cramon, von, D.Y. (2005). Sprachverstehen im Kontext: Bildgebende Studien zu Kohärenz und Pragmatik. *Sprache Stimme Gehör*, 29, 130-138

Folstein MF, Folstein SE, McHugh PR (1975). Mini-mental state: A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, 12, 189-198.

Gernsbacher, M.A. and Kaschak, M.P. (2003). Neuroimaging Studies of Language Production and Comprehension. *Annual Review of Psychology*, 54, 91-114

Johnson, D. & Cannizzaro, M.S. (2009). Sentence comprehension in agrammatic aphasia: History and variability to clinical implication. *Clinical Linguistics & Phonetics*, 23, 15-37

Kaan, E. & Swaab, T.Y. (2002). The brain circuitry of syntactic comprehension. *Trends in Cognitive Sciences*, 6, 8, 350-356

Kintsch, W. and Dijk, van, T.A. (1978). Toward a Model of Text Comprehension and Production. *Psychological Review*, 85, 5, 363-394

Klann, J. and Huber, W. (2011). Situationsmodell und narrative Shifts: Voruntersuchungen zur Diagnostik von sprachlichen und kognitiven Verstehensproblemen bei hirngeschädigten Patienten. *Sprache – Stimme – Gehör*, 35, e3-e9

Lojek-Osiejuk, E. (1996). Knowledge of scripts reflected in discourse of aphasics and right-brain-damaged patients. *Brain and Language*, 53 (1), 58-80

Mar, R.A. (2004). The neuropsychology of narrative: story comprehension, story production and their interrelation. *Neuropsychologica*, 42, 1414-1434

Marini, A. (2012). Characteristics of Narrative Discourse Processing after Damage to the Right Hemisphere. *Semin Speech Lang*, 33, 68-78

Mason, R.A. & Just, M. A. (2006). Neuroimaging contributions to the understanding of discourse processes. In M. Traxler, & M. A. Gernsbacher (Eds.), *Handbook of Psycholinguistics*, Second Edition.

Radvansky, G.A., Copeland, D.E., Berish, D.E. & Dijkstra, K. (2003). Aging and Situation Model Updating. *Aging Neuropsychology and Cognition*, 10, 2, 158-166

- Radvansky, G.A. & Dijkstra, K. (2007) Aging and situation model processing. *Psychonomic Bulletin & Review*, 14, 1027-1042
- Rich, S.S. and Taylor, H.A. (2000). Not all narrative shifts function equally. *Memory & Cognition*, 28, 7, 1257-1266
- Robertson, D. A., Grensbacher, M.A., Guidotti, S.J., Robertson, R.R., Irwin, W., Mock, B.J., & Campana, E. (2000). Functional neuroanatomy of the cognitive process of mapping during discourse comprehension. *Psychological Science*, 11, 255–60.
- Schulte, S. & Väisänen, A.J. (2006). *Narrative Shifts: Die Wahrnehmung von Erzählwechselln bei Sprachgesunden – eine Validierungsstudie*. Heerlen, Niederlande: Unveröffentlichte Bachelor-Arbeit
- Schulte, S. (2007). *Neuroanatomische Korrelate von narrativen Shifts bei Sprachgesunden – eine fMRT-Studie*. (Diplomarbeit im Fach Lehr- und Forschungslogopädie). Medizinische Fakultät der Rheinisch-Westfälischen Technischen Hochschule Aachen.
- Speer, N.K & Zacks, J.M. (2005). Temporal changes as event boundaries: Processing and memory consequences of narrative time shifts. *Journal of Memory and Language*, 53, 125–140
- Speer, N.K., Zacks, J.M., Reynolds, J.R. (2007). Human Brain Activity Time-Locked to Narrative Event Boundaries. *Psychological Science*, 18, 5, 449-455
- St. George, M., Kutas, M., Martinez, A. & Sereno M.I. (1999). Semantic integration in reading: engagement of the right hemisphere during discourse processing. *Brain*, 122, 1317-1325
- Trepel, M. (2012). *Neuroanatomie. Struktur und Funktion*. München: Urban & Fischer.
- Väisänen, A.J. (2010). *Narrative shifts: Die Wahrnehmung von Erzählereigniswechseln – ein intermodaler und interlingualer Vergleich*. (Diplomarbeit im Fach Lehr- und Forschungslogopädie). Medizinische Fakultät der Rheinisch-Westfälischen Technischen Hochschule Aachen.
- Whitney, C., Huber, W., Klann, J., Weis, S., Krach, S., Kircher, T. (2009). Neural correlates of narrative shifts during auditory story comprehension. *Neuro Image*, 47, 360-366

Whithworth, A., Webster, J., Howard, D. (2008). *A Cognitive Neuropsychological Approach to Assessment and Intervention in Aphasia*. East Sussex: Psychology Press.

Zacks, J.M., Braver, T.S., Sheridan, M.A., Donaldson, D.I., Snyder, A.Z., Ollinger, J.M., Buckner, R.L., Raichle, M.E. (2001). Human brain activity time-locked to perceptual event boundaries. *Nature neuroscience*, 4, 6, 651-655

Zacks, J.M., Speer, N.K., Swallow, K.M, Braver, T.S., Reynolds, J.R. (2007). Event Perception: A Mind/Brain Perspective. *Psychol Bull*, 133, 2, 273-293

Zalla, T., Phipps, M., Grafman, J. (2002) Story processing in patients with damage to the prefrontal cortex. *Cortex*, 38, 215-231

Zwaan, R.A. and Radvansky, G.A. (1998). Situation Models in Language Comprehension and Memory. *Psychological Bulletin*, 123, 2, 162-185

Zwaan, R.A. (1999). Situation Models: The Mental Leap Into Imagined worlds. *Current Directions in Psychological Science*, 8, 1, 15-18

Figures:

Figure 1: *Brodman areas on the lateral surface (BA 44&45 are highlighted with arrows)*. Adapted from: Trepel, M. (2012). *Neuroanatomie. Struktur und Funktion*. München: Urban & Fischer.

APPENDIX 1

In the following the raw data of the results will be given per story and presentation mode:

1. Mall
 - a. Film
 - b. Text
2. Pool
 - a. Film
 - b. Text
3. Barber
 - a. Film
 - b. Text
4. Queen
 - a. Film
 - b. Text

Mall – film

Nr. #	Proposition	Time	LHD	LHD C	RHD	RHD C	n=8	prestudy (n=20)	Total shifts n=8	Total shifts prestudy
1	Mr. Bean in the mall, showing credit card	0:24 - 0:28		2	1	2	5		17	8
2	Mr. Bean in the perfume department	0:53 - 0:59		1	1	2	4			
3	Mr. Bean in the cosmetics department	1:19 - 1:31		1	1	2	4	17		
4	Mr. Bean unwrapping toothbrush	1:42- 1:45		1	1	2	4			
5	Mr. Bean in the towel department	2:04 - 2:13		2	1	2	5	20		
6	Mr. Bean on the escalator	2:40 - 2:52		2	2	2	6	18		
7	Mr. Bean in the knife department	3:05 - 3:15		2		2	4	19		
8	Mr. Bean trying paring knife	3:22 - 3:30		1	2	2	5			
9	Mr. Bean in the pan department	3:47 - 3:54		2	1	2	4	18		
10	Mr. Bean trying to fit a fish in a pan	3:58 - 4:05		1	1	2	4			
11	Mr. Bean in the telephone department	4:16 - 4:23		2	1	1	4	20		
12	Mr. Bean taking department telephone, walking to the register where a man is already standing	4:45 - 4:52		2	1	2	5	20		
13	The man taking Mr. Bean's credit card	5:11 - 5:19		1	1	2	4			
14	Mr. Bean having his hand in the man's pocket	5:27 - 5:34		1	1	2	4			
15	The man walking away with Mr. Bean having his hand in the man's pocket	5:42 - 5:50		2	2	2	6	15		
16	Change of place: toilets	5:57 - 6:02	1	2	1	1	5			
17	The man on the toilet with Mr. Bean	6:09 - 6:15		2		2	4			

Mall - text

Nr. #	Proposition	Time	LHD	LHD C	RHD	RHD C	n=8	prestudy (n=20)	Total shifts n=8	Total shifts prestudy
1	Mr. Bean starting purchasing	0:31 - 0:34		1	1	2	4		15	8
2	Mr. Bean in the perfume department	0:33 - 0:45	1	1	1	2	5	15		
3	Mr. Bean frightening off woman from perfume department	1:02 - 1:14						17		
4	Mr. Bean in the cosmetics department	1:18 - 1:19		1	1	2	4			
5	Mr. Bean in the towel department	1:55 - 2:08	1		2	1	4	17		
6	Mr. Bean leaving towel department, standing on the escalator	2:21 - 2:31		1	1	2	4	16		
7	Mr. Bean walking towards the knife department	2:42 - 2:52	2	1	1	2	6	15		
8	Mr. Bean in the knife department	2:51 - 3:00		2	1	1	4			
9	Mr. Bean in the pan department	3:21 - 3:30		2	1	2	5	15		
10	Mr. Bean in the telephone department	3:42 - 3:50		2	1	2	5	15		
11	Mr. Bean taking department telephone, walking to the register where a man is already standing	4:01 - 4:14	1	2	1	2	6	14		
12	Mr. Bean placing credit card next to man's credit card	4:24 - 4:25		2	1	1	4			
13	Mr. Bean trying to exchange credit cards from the man's pocket	4:41 - 4:50		2	2	2	6			
14	The man walking away with Mr. Bean having his hand in the man's pocket, into bathroom	5:00 - 5:14		2	1	2	5			
15	The man on the toilet with Mr. Bean	5:21 - 5:30		2	2	1	5			
16	The man noticing Mr. Bean	5:47 - 5:55		2	1	1	4			

Pool - film

Nr. #	Proposition	Time	LHD	LHD C	RHD	RHD C	n=8	prestudy (n=20)	Total shifts n=8	Total shifts prestudy
1	Mr. Bean in the pool area, looking at slides	0:06 - 0:15		1	1	2	4		10	3
2	Mr. Bean on the slide	0:21 - 0:28		2		2	4			
3	Pool attendant entering	0:32 - 0:41		1	1	2	4	14		
4	Mr. Bean seeing and running towards diving platform	1:08 - 1:18		1	1	1	4	14		
5	Mr. Bean climbing on to the diving platform	1:25 - 1:29		2	2	2	4			
6	Mr. Bean on the platform, realizing height	1:36 - 1:43			1	1	4			
7	2 boys entering the platform	2:36 - 2:45		2	1	2	4	16		
8	Mr. Bean falling on the platform, boys looking at watch, irritated	3:19 - 3:25	1	1	1	1	4			
9	Pool attendant looking at Mr. Bean	4:03 - 4:06	1	1	1	1	4			
10	Boy stepping on Mr. Bean's hand, Mr. Bean falling from the platform	4:15 - 4:17		1	1	2	4			

Pool - text

Nr. #	Proposition	Time	LHD	LHD C	RHD	RHD C	n=8	prestudy (n=20)	Total shifts n=8	Total shifts prestudy
1	Mr. Bean in the pool area, looking at slides	0:02 - 0:11		2	1	2	5		14	4
2	Mr. Bean climbing on slide	0:17 - 0:18		2	1	2	5			
3	Pool attendant entering	0:26 - 0:28		2	1	2	5			
4	Mr. Bean trying to get off the slide	0:37 - 0:42	1	2	1	2	6			
5	Mr. Bean running through the swimming area	0:46 - 0:54		2	1	2	5	18		
6	Mr. Bean seeing and running towards diving platform	1:03 - 1:15		2	2	2	6	15		
7	Mr. Bean climbing on to the diving platform	1:23 - 1:28		2	2	2	6			
8	Mr. Bean lying on the platform, observing height	1:58 - 2:04		2	2	1	5			
9	2 boys entering the platform	2:18 - 2:23		2	2	2	6	17		
10	Mr. Bean trying to be/look strong	2:31 - 2:35		2	1	2	5			
11	Mr. Bean trying to jump	2:53 - 3:00	1	2	2	1	6			
12	Mr. Bean crawling to the edge of the platform	3:14 - 3:17		2	1	1	4			
13	Mr. Bean holding on to the platform with one hand	3:33 - 3:43						14		
14	Boy having an idea	3:55 - 3:57		2	2	1	5			
15	Boy stepping on Mr. Bean's hand, Mr. Bean falling from the platform	4:03 - 4:11	1	2	1	2	6			

Barber - film

Nr. #	Proposition	Time	LHD	LHD C	RHD	RHD C	n=8	prestudy (n=20)	Total shifts n=8	Total shifts prestudy
1	Mr. Bean entering the barber-salon	0:08 - 0:09	1	1	1	1	4		11	8
2	Mr. Bean mocking about a hairstyle	0:50 - 0:55		1	1	2	4			
3	Barber leaving the room, answering the telephone	1:41 - 1:50		1	1	2	4	14		
4	Mr. Bean coifing an invisible customer, Boy and mother entering the room	2:21 - 2:31		2	1	1	4	18		
5	Mr. Bean cutting a customer's (boy) hair, man entering the salon	3:22 - 3:28		1	2	2	5			
6	Mr. Bean cutting a hole in the boys hair	3:51 - 4:00		1	1	2	4			
7	Customer leaving the room, barber coming back	4:57 - 5:03						16		
8	Barber leaving the room again, new customer (old man) entering	5:08 - 5:18		2	1	2	5	16		
9	Mr. Bean helping customer, other customer entering, complaining about waiting times	5:37 - 5:46	1	1	1	2	5			
10	Mr. Bean cutting customer's pony tail	6:21 - 6:28	1		1	2	4			
11	Change between customers	6:45 - 6:55		2	1	2	5	14		
12	Barber coming back, being paid by (to him) unknown customer	9:14 - 9:20						18		
13	Mother and child enter the salon, complaining	9:20 - 9:25	1	2	1	2	6	14		
14	Mr. Bean leaving the salon secretly	9:41 - 9:46						15		

Barber - text

Nr. #	Proposition	Time	LHD	LHD C	RDH	RHD C	n=8	prestudy (n=20)	Total shifts n=8	Total shifts prestudy
1	Barber showing the result to customer	0:12 - 0:18		1	1	2	4		19	8
2	Mr. Bean entering the barber-salon	0:21 - 0:27		2	1	2	5	16		
3	Barber attends new customer (Mr. Bean)	0:36 - 0:44		2	1	2	5			
4	Mr. Bean sitting down on the barber chair	1:03 - 1:05		1	2	1	4			
5	Barber leaving the room, answering the telephone	1:22 - 1:31		2	1	1	4	17		
6	Mr. Bean being annoyed	1:46 - 1:55	1	1	1	2	5			
7	Mr. Bean coifing an invisible customer, Boy and mother entering the room	1:52 - 2:01	1	2	1	1	5	18		
8	Boy sitting down on chair	2:11 - 2:18		2	2	1	5			
9	Mr. Bean cutting the boy's hair with a bowl	2:53 - 2:55	1	1	1	1	4			
10	Man entering the salon	3:11 - 3:20		2	2	2	6	18		
11	Confrontation with the boy's cut	3:33 - 3:37		1	1	2	4			
12	Mother entering the salon	3:52 - 3:58		2	1	1	4			
13	Mother and boy leaving the salon	3:59 - 4:09	1	2	1	2	6	16		
14	Barber leaving the room again, new customer (old man) entering	4:16 - 4:23		2	1	2	5	14		
15	Old man sitting on the chair, other customer coming back in	4:37 - 4:48	1	1	1	1	4			
16	Mr. Bean covering up mistake in cutting	6:52 - 7:00		1	2	1	4			
17	Mr. Bean attending the man	7:10 - 7:25	1		2	1	4	14		
18	The man leaves the room, barber comes back	7:38 - 7:50		1	2	2	5	16		
19	Mr. Bean leaving the salon secretly	8:06 - 8:13	1	1	2	2	6			

Queen - film

Nr. #	Proposition	Time	LHD	LHD C	RHD	RHD C	n=8	prestudy (n=20)	Total shifts n=8	Total shifts prestudy
1	Mr. Bean arrives too late	0:28 - 0:33		2	2	1	5		12	6
2	Mr. Bean looking at dirty shoes	1:06 - 1:10						20		
3	Mr. Bean cleaning shoes	1:11 - 1:16		2	1	2	5			
4	Man checking breath	1:39 - 1:42	1	1	1	2	5			
5	Mr. Bean using mouth spray	2:07 - 2:13		1	1	2	4			
6	Mr. Bean brushing teeth with finger	2:46 - 2:55		2	1	2	5	17		
7	Mr. Bean pulling floss from his teeth	3:46 - 3:51	1	1	1	2	5			
8	Mr. Bean noticing missing pocket square	4:13 - 4:20						18		
9	Mr. Bean do-it-yourself pocket square	4:46 - 4:51		1	1	2	4			
10	Mr. Bean cleaning fingernails (with mouth)	5:07 - 5:18		2	1	1	4	18		
11	Mr. Bean cleaning fingernails (with zipper)	5:21 - 5:26		1	1	2	4			
12	The Queen entering the room	5:41 - 5:50		2	1	2	5	18		
13	Mr. Bean noticing open zipper	5:52 - 5:55		2	1	2	5			
14	Mr. Bean greeting and knocking over Queen	6:18 - 6:23		2	1	2	5	16		

Queen - text

Nr. #	Proposition	Time	LHD	LHD C	RHD	RHD C	n=8	prestudy (n=20)	Total shifts n=8	Total shifts prestudy
1	The Queen on her way to the film premiere	0:01 - 0:08		1	2	1	4		24	7
2	Butlers standing in a row, one (Mr. Bean) arriving too late	0:19 - 0:29		2	2	2	6	16		
3	Mr. Bean making a happy face	0:38 - 0:45		1	1	2	4	15		
4	Mr. Bean practicing the procedure, discovering dirty shoes	0:53 - 1:00	1	1		2	4	17		
5	Mr. Bean trying to clean his shoes	1:09 - 1:15	1	1	1	2	5			
6	Mr. Bean spitting on his shoes, cleaning them	1:22 - 1:24		1	1	2	4			
7	Other butler checking breath	1:31 - 1:34		1	1	2	4			
8	Mr. Bean shocked by own breath	1:52 - 1:56	1	1	1	2	5			
9	Mr. Bean using mouth spray	2:03 - 2:07	1		2	2	5			
10	Mr. Bean still using mouth spray, now secretly	2:17 - 2:23	1	1		2	4			
11	Mr. Bean practicing the procedure, brushing teeth with his finger	2:26 - 2:40		1	1	2	4	16		
12	Mr. Bean secretly pulling a thread from maid's apron	2:46 - 2:54	1	1	1	2	5			
13	Mr. Bean using thread as floss	3:02 - 3:06		1	1	2	4			
14	Maid's apron loosens	3:11 - 3:16		1	1	2	4			
15	Mr. Bean making a feint for the other butlers	3:25 - 3:30		1	1	2	4			
16	Mr. Bean pulling thread from his teeth	3:32 - 3:39			2	2	4	14		
17	Mr. Bean noticing missing pocket square	3:42 - 3:46		1	1	2	4			
18	Mr. Bean trying to steal pocket square from other butler	4:03 - 4:10		1	2	2	5			
19	Mr. Bean trying to cover up scam	4:11 - 4:20		1	1	2	4			
20	Mr. Bean do-it-yourself pocket square	4:26 - 4:29		1	1	2	4			
21	Mr. Bean cleaning fingernails	4:30 - 4:37						15		
22	The Queen entering the room	5:04 - 5:09		1	2	2	5	16		
23	Mr. Bean trying to close his zipper	5:16 - 5:18		1	2	2	5			
24	Mr. Bean putting his finger through the zipper fly	5:27 - 5:34		1	1	2	4			

25	Mr. Bean clears away	5:48 - 5:49		1	1	2	4			
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APPENDIX 2

In the following, the written texts of the stories used in the study are given. Since this study was executed in Germany, the texts are in German as well.

Lesetexte

Einkaufszentrum

Ein Mann bummelt durch die Stadt. An seinem linken Arm trägt er einen Einkaufskorb. Beschwingten Schrittes spaziert er an die Einkaufsstraße entlang und betrachtet die reich geschmückten Schaufenster. Schließlich bleibt er vor einem Kaufhaus stehen. Er zückt seine Kreditkarte und lächelt voller Vorfreude auf das bevorstehende Einkaufsvergnügen. Der Mann öffnet voller Erwartung die Eingangstür des riesigen Einkaufszentrums und tritt begeistert ein. Drinnen holt er erneut seine Kreditkarte hervor und zeigt sie ganz stolz im Raum herum. Dann beginnt er mit seinem Einkauf. Zuerst schlendert er durch die Parfümabteilung, vorbei an Tischen mit Kosmetika und Parfümflaschen. An einigen Tischen stehen Damen, die verschiedene Parfüms testen. So steigen dem Mann die unterschiedlichsten Düfte in die Nase. Allerdings scheint er das nicht zu vertragen, und er fängt an, abwehrend mit den Armen in der Luft herumzufuchteln. Scheinbar dem Erstickungstod nahe fasst er sich mit beiden Händen an den Hals und hustet, bis er schließlich unter theatralischen Verrenkungen zu Boden gleitet. Von dort aus robbt er sich mühsam in die nächste Abteilung. Dort angekommen steht er wieder auf und verscheucht unter gestischen Andeutungen eine Frau, bevor sie die Parfümerie betreten kann. Dann geht er weiter in die Kosmetikabteilung. Wieder entspannter schaut der Mann sich suchend um und entdeckt prompt das Objekt seiner Begierde: Zahnbürsten.

Nach längerer kritischer Begutachtung nimmt er eine Zahnbürste aus dem Regal und probiert sie direkt vor Ort aus. Das Ergebnis stellt ihn offenbar zufrieden, und er entscheidet sich, das Utensil zu kaufen. Dann zögert er jedoch, schaut sich um und stellt die Zahnbürste doch wieder ins Regal zurück. Stattdessen nimmt er eine ungeöffnete Packung aus dem Regal und legt diese in seinen Einkaufskorb. Zufrieden verlässt der Mann die Kosmetikartikelabteilung und betritt schwungvoll und frohen Mutes eine Abteilung in der Handtücher verkauft werden. Dort stellt er seinen Korb auf den Boden und greift nach einem hellgelben Badetuch. Auch dieses muss erst mal auf seine

Gebrauchsfähigkeit hin untersucht werden. Er faltet es auseinander, stellt sich vor einen Spiegel und bindet es sich um die Hüften.

Er betrachtet sich ausgiebig, als ihm plötzlich das Handtuch auf den Boden fällt und er sich erschrocken die Hände vor den Schritt hält. Erleichtert bemerkt er seinen Irrtum. Hastig legt er das Handtuch in seinen Korb und eilt aus der Handtuchabteilung. Im nächsten Moment steht er auch schon auf der Rolltreppe ins obere Stockwerk. Dabei ist sein Blick starr ins Nichts gerichtet, und er wirkt vom Einkaufen ganz erschöpft. Müde hält er sich am Geländer fest, bis er oben ankommt. Dort bleibt er zunächst regungslos stehen. Als er bemerkt, dass die Rolltreppe schon längst am Ende angekommen ist, tritt er von ihr weg und läuft geradewegs in die Haushalts- und Küchenabteilung. Auch hier schaut er sich erst einmal um. Als er das Gesuchte gefunden hat, stellt er den Korb auf den Boden und greift nach einem Schälmesser.

Er schaut sich prüfend um, um sicherzustellen, dass er nicht beobachtet wird. Dann holt er eine Kartoffel aus der Jackentasche und probiert den Schäler aus. Offensichtlich stellt ihn die Qualität des Schälmessers nicht zufrieden. So testet er einen weiteren Schäler. Mit dem Ergebnis des zweiten Tests hoch zufrieden steckt er die Kartoffel wieder weg. Dann legt er das Schälmesser in den Korb und geht weiter zu den Regalen mit Pfannen und Töpfen. Bei den Pfannen bleibt er stehen. Er nimmt eine Pfanne und betrachtet sie eingehend. Nicht genug damit: Dann zieht er auch noch einen toten Fisch aus dem Jackett und legt ihn in die Pfanne. Da diese zu klein ist, entscheidet er sich schließlich für eine größere Pfanne, und der Fisch verschwindet wieder im Jackett. Zufrieden nimmt er seinen Einkaufskorb und geht weiter. Sein nächstes Ziel ist die Telefonabteilung. Dort probiert er mehrere Telefone aus. Enttäuscht, dass keines funktioniert, versucht er die vermeintliche Störung zu beheben, indem er einen Hörer auf das Regalbrett schlägt. Da dies nichts hilft, geht er weiter. Er kommt zum das Abteilungstelefon. Erneut hebt er den Hörer ab. Endlich ist etwas zu hören. Kurzerhand nimmt er das Telefon mit zur Kasse.

Dort wartet bereits ein älterer Herr, der sich ungehalten an ihm vorbeidrängelt. Der ältere Herr wird bald bedient und legt zum Bezahlen seine Kreditkarte auf den Kassentisch. Unser Held legt seine Kreditkarte stolz daneben. Ab hier nimmt das Unglück seinen Lauf: Der ältere Herr stellt beim Bezahlen seine Tasche auf die eigene Kreditkarte und steckt ungeduldig die falsche Kreditkarte ein. Unser Mann versucht vergeblich den älteren Herrn auf das Missverständnis aufmerksam zu machen. Schließlich nimmt er die Sache in die Hand und versucht die Karten eigenhändig auszutauschen. Er fasst behutsam in die hintere Hosentasche des Anderen und greift vorsichtig nach dessen Portemonnaie. Geschickt schafft er es, das Portemonnaie aus der Hosentasche herauszuholen. Ebenso

unauffällig tauscht er die beiden Kreditkarten aus. Nun muss das Portemonnaie nur noch zurück in die Hosentasche. Auf diese Weise durchqueren die beiden den Laden bis sie am Ziel, der Herrentoilette, angekommen sind.

Nach einem vergeblichen Befreiungsversuch nimmt der Mann verzweifelt hin, dass er dem älteren Herrn wohl oder übel auch weiter in die Tiefen der Herrentoilette folgen muss. Der wiederum geht nun in eine Toilettenbox, zieht die Hose herunter und setzt sich. Endlich kann unser Unglückspilz seine Hand aus der Hosentasche befreien. Peinlich berührt versucht er sich unsichtbar zu machen und hockt sich in die hintere Ecke der Toilettenbox. Zu allem Unglück ist das Toilettenpapier abgewickelt, so dass sich der ältere Herr nach verrichtetem Geschäft suchend umsieht. Freundlich reicht ihm unser Held eine neue Rolle. Höflich bedankt sich der ältere Herr. Dann jedoch fährt ihm der Schrecken über den ungebetenen Gast in die Glieder, und er springt auf. Da passiert es: Während seine Hand noch in der fremden Hosentasche steckt, geht der ältere Herr los.

Schwimmbad

Ein Mann kommt aus der Dusche ins Schwimmbad. Er wirkt unbeholfen und schüchtern. Zunächst schaut er sich ein wenig um. Da entdeckt er im Bereich des Kinderbeckens Elefantenrutschen und ist ganz begeistert. Freudestrahlend läuft er auf sie zu und klettert auf eine der Rutschen hinauf. Oben angekommen streichelt er zuerst einmal liebevoll ein Elefantenohr. Dann setzt er sich hin und streckt die Beine aus. Da kommt ein Bademeister aus dem Geräteraum. Er entdeckt den erwachsenen Mann auf der Kinderrutsche und genau in dem Moment, in dem der Mann die Rutsche hinunterrutschen möchte, bläst der Bademeister in seine Trillerpfeife. Erschrocken bis ins Mark bremst der Mann seinen Rutschversuch ab und klettert umständlich die Rutsche wieder hoch. Der Bademeister ruft dem Mann etwas zu und verweist ihn aus dem Kinderbereich. Schuld bewusst läuft dieser hastig in dem Schwimmbereich. Aufgeregt und noch völlig unter Spannung stehend kommt er dort an. Dabei schaut er nach dem Bademeister und läuft prompt rückwärts gegen das Geländer am Beckenanfang. Dort schaut er sich ratlos um und entdeckt am Ende des Beckens einen Sprungturm. Voller Begeisterung rennt er zum Sprungturm und erklimmt sogleich die Sprungturmleiter. Im Vorübergehen schenkt er einem Jungen, der gerade vom Einmeterbrett springt, ein überhebliches Lächeln und steigt selbst weiter in die Höhe. Mit stolzer Brust betritt er das höchste Brett. Während er den Blick verträumt umherschweifen lässt, geht er schwingvollen Schrittes zum vorderen Brettrand vor. Dort riskiert er einen fröhlichen Blick in die Tiefe und erschreckt sich fast zu Tode. Panisch

sucht er Halt am Geländer. Sich dort sicher glaubend wagt er einen zweiten Blick hinunter ins Becken und schreckt erneut zurück.

Diesmal sucht er Halt an beiden Seiten des Brettes und versucht, sich am rechten und linken Geländer gleichzeitig festzuhalten. Diese liegen jedoch zu weit auseinander und so legt sich der Mann schließlich auf den Bauch. Aus dieser vermeintlich sicheren Position neuen Mut schöpfend robbt er an den vorderen Brettrand und wagt abermals einen Blick in die Tiefe. Wen sollte es überraschen: Er erschreckt sich erneut, zuckt zurück und nach einer kurzen Verschnaufpause, während der er auf dem Brett liegen bleibt, fängt er an, sich verkrampft am Geländer aufzurichten. Da betreten zwei Jungen das Brett. Die beiden schauen dem Mann verständnislos zu. Als dieser die Jungen bemerkt, versucht er, Souveränität zu mimen. Daher lehnt er sich gelassen ans Geländer. Doch schon bald begreift er, dass weitere Schritte erforderlich sind und er wohl oder übel hinunter springen muss. Also lässt er zaghaft das Geländer los und stakst bibbernd vor Angst zum Rand des Sprungbrettes. Dabei sieht er sich prüfend nach den Jungen um. Seinen Blick auffangend schauen diese demonstrativ auf die Uhr. Um die Jungen zu beeindrucken, setzt der Mann nun zum Kopfsprung an. Dabei zittert er am ganzen Körper. Verzweifelt macht er die Augen zu und fängt an, vor und zurück zu wippen. Schließlich kippt er nach hinten über und bleibt auf dem Sprungbrett liegen. Während die Jungen das Schauspiel gelangweilt beobachten, und erneut demonstrativ nach der Uhrzeit schauen, kriecht der Mann auf allen Vieren zum Brettrand. Umständlich dreht er sich dort so, dass er die Beine vom Brett hängen lassen kann, während er sich mit den Armen und Händen am Sprungbrett festhält. Trotz der schlechten Erfahrungen, wagt er nochmals den Blick in die Tiefe. Dabei erschreckt er sich so sehr, dass seine Augen groß und sein Atem sichtlich schwer werden. Er rudert mit den Beinen in der Luft, bis er schließlich nur noch mit den Händen am Brett hängt. Da wird er erneut vom Bademeister entdeckt. Dieser verfolgt fassungslos das Geschehen. Aus einem nicht ersichtlichen Grund lässt der Mann in diesem Moment mit einer Hand das Brett los, so dass sein ganzes Gewicht nun an der einen verbleibenden Hand hängt. Da scheint einer der beiden Jungen auf eine Idee gekommen zu sein. Er flüstert seinem Freund etwas ins Ohr und läuft schnell zu unserem Mann. Dann holt er mit einem Bein aus und tritt dem armen Mann mit voller Kraft auf die Hand. Im Schmerzreflex zieht dieser die Hand vom Brett und stürzt in die Tiefe. So hat unser Held endlich doch seinen Sprung vom Dreimeterbrett geschafft.

Frisör

Die Sonne scheint in einen Frisörsalon hinein. Der Frisör ist gerade mit dem Haarschnitt seines einzigen Kunden fertig geworden. Zum Abschluss besprüht er das frisch frisierte Haar mit etwas Festiger. Danach nimmt er einen Spiegel zur Hand und lässt den Kunden das Ergebnis der Frisierarbeit von allen Seiten betrachten. Dieser nickt zufrieden. Während der Frisör noch mit dem Säubern der Kleidung seines Kunden beschäftigt ist, betritt ein neuer Kunde den Salon. Zunächst muss dieser noch warten, bis der Frisör bereit ist. Er setzt sich unwillig auf einen Stuhl, doch schon bald liest er mit Begeisterung in einem Comicheft. Schließlich ist der erste Kunde gegangen und der Frisör widmet sich unserem neuen Kunden.

Er führt diesen zu einer Wand, an der Photographien verschiedener Frisuren hängen. Dort bittet er ihn, sich eine Frisur auszuwählen. Amüsiert zeigt der Kunde zunächst auf eine Herrenfrisur mit Pferdeschwanz und macht sich über diese lustig, indem er ein Pferd imitiert. Dann entscheidet der Mann sich für eine klassische Frisur, wie sie auch Prince Charles trägt. Der Mann setzt sich auf den Frisörstuhl und bekommt einen Umhang übergeworfen. Der Frisör will mit dem Schneiden der Haare beginnen. Der Kunde, der sich inzwischen wieder mit dem Comicheft beschäftigt, macht ihm jedoch einen Strich durch die Rechnung. Denn beim Lesen senkt er immer genau dann den Kopf, wenn der Frisör zum Schneiden ansetzt. Auch die steten Versuche, den Kopf des Kunden zu richten, nützen dem Frisör nichts. Da klingelt das Telefon und der Frisör rennt hastig in ein Nebenzimmer. Der Kunde ist mittlerweile von dem Comic gelangweilt und wirft das Heft entnervt auf den Tisch vor sich. Erst jetzt bemerkt er dass der Frisör nicht mehr da ist. Ungläubig schaut er über seine eigene Schulter, steht auf, schaut sich im Raum um und geht ein paar Schritte in Richtung des Nebenzimmers. Scheinbar unter Zeitdruck schaut er auf die Uhr und ärgert sich. Unschlüssig darüber, was er tun soll, fängt er an einem imaginären Kunden die Haare zu schneiden. Kurz darauf betritt eine Mutter mit ihrem Sohn hektisch den Frisörsalon. In dem Glauben, den Frisör vor sich zu haben, fragt sie unseren wartenden Kunden, ob sie den Jungen bereits dort lassen könne, während sie selbst schnell die vergessene Geldbörse hole. Der Junge setzt sich auf den Frisierstuhl und zieht sich seine Kappe aus, die Mutter verlässt den Salon. Von der Situation überrumpelt, erlaubt sich unser Kunde einen Spaß und schlüpft in die Rolle des Frisörs. Der Junge beginnt, in dem Comicheft zu lesen. Währenddessen schneidet unser Scheinfrisör unbeholfen aber begeistert die erste Strähne ab, die er dem Jungen sogleich stolz zeigt. Dieser schaut ihn verständnislos an, blickt auf die Uhr und verdreht die Augen. Unser Scheinfrisör hat die Signalwirkung des Blickes durchaus verstanden und schickt sich an,

von nun an sein Unterfangen mit mehr Geschwindigkeit zu gestalten. Er beschließt freudig grinsend die Schnellversion auszuprobieren. Er nimmt eine Rührschüssel, setzt sie dem Jungen auf den Kopf und scheidet einfach reihum die Haare ab. Der Junge schaut sich erschrocken im Spiegel an. Als nächstes zückt der Scheinfrisör einen elektrischen Rasierer. Als er diesen die Steckdose steckt, ist er für einen kurzen Moment unaufmerksam und schon schneidet er dem Jungen aus Versehen ein Loch in die Haare. Just in dem Moment betritt ein Mann mit selbstbewusstem Schritt den Frisörsalon. Er bleibt vor dem Spiegel stehen und betrachtet sich eitel. Dieser Mann ist vollkommen von sich überzeugt. Schnell versucht unser Scheinfrisör die misslungene Frisur des Jungen zu verdecken und redet dem Schönling gut zu, sich trotz einer kurzen Wartezeit zu gedulden und im Wartebereich Platz zu nehmen. Wieder mit dem Problem konfrontiert, dem Jungen die Haare verschnitten zu haben, überlegt unser Scheinfrisör, was er nun tun soll. Ihm kommt eine glänzende Idee. Er schneidet dem Jungen einfach in der Mitte des Kopfes die Haare in einer Bahn weg. Zuerst ist der Junge schockiert, doch dann gefällt ihm die neue Frisur ausgezeichnet. Gerade fertig geworden, betritt die Mutter den Laden und der Scheinfrisör zieht dem Jungen hastig dessen Kappe auf, um die verunglückte Frisur zu verdecken. Mutter und Sohn verlassen den Laden, dicht gefolgt vom Schönling, der ein Telefonat führen muss. Der echte Frisör kommt zurück und entschuldigt sich bei unserem Scheinfrisör für die Wartezeit. Dieser schlüpft schnell wieder die Kundenrolle. Doch da klingelt erneut das Telefon und der Frisör eilt davon. Im selben Moment betritt ein Mann den Frisörsalon. Unser Scheinfrisör befühlt das Geld, das er als Bezahlung für die Frisur des Jungen bekommen hat und denkt sich, dass er auch noch ein zweites Mal Frisör spielen könne. Er geht also zu dem alten Herrn der mittlerweile seine Brille abgesetzt und somit halb blind zu sein scheint. Er lässt sich bereitwillig den Frisörumhang anziehen. In dem Moment betritt der Schönling den Raum, der zuvor überstürzt den Laden verlassen hatte. Direkt beschwert er sich, weil nun ein neuerer Kunde vor ihm bedient wird. Der Scheinfrisör begleitet ihn zu einem Frisierstuhl und zieht auch ihm einen Umhang über. Dabei versucht er es seinem Kunden so angenehm wie möglich zu machen. Begeistert sieht der Scheinfrisör, dass der Kunde just so einen Pferdeschwanz hat, wie er ihn gerne gehabt hätte. Mit Kamm und Schere bewaffnet überlegt er, wie er anfangen soll. Er schneidet zunächst eine kleine Strähne ab und bleibt dann mit dem Blick an der Zeitschrift des Schönlings hängen. Dadurch abgelenkt schneidet er aus versehen den Pferdeschwanz ab. Als er das bemerkt, erschreckt er sich fürchterlich. Der Schönling schaut aufgeschreckt kurz auf. Um Normalität vorzutäuschen, nimmt unser Scheinfrisör den Festiger und besprüht damit die Haare des Mannes. Anschließend bittet der Scheinfrisör den Schönling, kurz zu warten, und eilt dann zu seinem anderen Kunden. Dieser hat die ganze Zeit

geduldig gewartet. Der Scheinfrisör zückt wieder den elektrischen Haarschneider. Da er beim letzten Mal eine so unangenehme Erfahrung mit diesem Gerät gemacht hat, agiert er diesmal vorsichtiger. Mit angespanntem Gesicht und der Zunge zwischen den Zähnen beginnt er, vorsichtig die Haare des alten Herrn zu kürzen. Doch auch diesmal hat er trotz alledem kein Glück. Der Rasierer verfängt sich in dem Toupet des alten Herrn und gibt wütende Geräusche von sich. Es beginnt ein Kampf zwischen Scheinfrisör und Rasierer, wobei unser Frisör mutig versucht, dem Gerät das Toupet zu entreißen, aber es will ihm nicht gelingen. Der Kunde wird nun aufmerksam und wundert sich über die eigenartigen Geräusche hinter seinem Rücken. Der Scheinfrisör gerät in Panik, weil das Toupet immer noch fest steckt. In seiner Not entschließt er sich, den Rasierer samt Toupet in einer Schublade verschwinden zu lassen. Völlig aufgelöst zieht er noch schnell den Stecker und das Gerät gibt Ruhe. Der ältere Herr hat zum Glück nicht viel mitbekommen, weil er ja ohne seine Brille kaum was sieht. Nebenan liest der Schönling in aller Ruhe eine Zeitschrift. Um wenigstens irgendetwas zu machen, greift der Scheinfrisör nach Schaumfestiger. Er fängt an die kahle Stelle am Hinterkopf des alten Herrn damit auszufüllen.

Hektisch fuchtelnd greift er nach dem Rasierpinsel und verteilt den Schaum. Da ihm das Toupet abhanden gekommen ist, muss er sich nun anders behelfen. Er greift nach den Haarabfällen und befördert einen Büschel Haare zutage. Der Schönling ist ob der langen Wartezeit inzwischen unwillig und schaut genervt auf die Uhr. Bald wird er erlöst, und der Scheinfrisör wendet sich ihm zu. Schnell fährt unserem Frisör der Schrecken in die Glieder, als ihn der verstümmelte Zopf am Hinterkopf des Mannes an sein Missgeschick erinnert.

Um Schelte abzuwenden, zeigt er dem Schönling anstelle von dessen gespiegelter Hinterkopfansicht die Frisurenfotographie mit der Pferdeschwanzfrisur. Der Schönling ist mit dem Ergebnis zufrieden, bezahlt und geht. Schnell wird auch noch der andere Kunde fertig gemacht. Da kommt der echte Frisör vom Telefonieren zurück und wird prompt von dem ihm fremden Kunden bezahlt. Der Frisör rennt dem Mann erstaunt hinterher. Da betritt die wütende Mutter mit ihrem Sohn den Laden. Auch der Schönling kehrt zurück. Beide zeigen dem Frisör die verschandelten Frisuren. Während dessen macht sich der falsche Frisör unbemerkt aus dem Staub. Er versteckt sich hinter dem Portrait von Prinz Charles, und wird auch noch mit einer Verbeugung verabschiedet.

Queen

Die englische Königin ist auf dem Weg zu einer königlichen Filmpremierre. Gut bewacht und von mehreren Fahrzeugen eskortiert fährt ihre Limousine eine regennasse Straße entlang. Hinter einer Absperrung stehen zahlreiche Menschen und jubeln der Königin zu. Schließlich halten die Limousinen vor einem Kino an. In der Empfangshalle stehen die Diener erwartungsvoll in Reih und Glied. Ein Diener hat sich verspätet und stellt sich eilig an seinen Platz. Um seine Verspätung zu erklären, gibt er den Kollegen zu verstehen, dass seine Uhr stehen geblieben sei. Die Kollegen zeigen jedoch keinerlei Interesse an seiner Entschuldigung. Daraufhin widmet sich der zu spät Gekommene seiner Vorfremde und schneidet seinem Nachbarn eine Freudengrimasse. In der Folge wendet sich auch dieser angewidert von ihm ab. Dies macht dem Verspäteten aber gar nichts aus, denn längst hat er begonnen, aufgeregt den vorgesehenen Ablauf des Geschehens zu proben. Dabei fällt sein Blick auf die polierten Schuhe seines Nachbarn. Entsetzt realisiert er den ungleich schlechteren Zustand des eigenen Schuhwerks. Unbeholfen versucht er sich die Schuhe am Hosenbein zu polieren. Das misslingt ihm allerdings und er zieht eine Grimasse. Hilfe suchend dreht er sich zu seinem Nachbarn um. Die Situation ist ihm reichlich unangenehm und scheint noch dazu aussichtslos zu sein. Schließlich hat er eine Idee. Er sammelt Spucke in seinem Mund zusammen, spuckt sich auf die Schuhe und reibt diese am Hosenbein blank. Sein rechter Nachbar überprüft inzwischen den eigenen Atem. Dazu hält er sich die rechte Hand vor den Mund, atmet kräftig aus und riecht am Ergebnis. Die Aktion animiert unseren zu spät Gekommenen, ebenfalls seinen Atem zu untersuchen. Mehrfach atmet und riecht er in die Luft, kann aber auf diese Weise nichts feststellen. Schließlich haucht er in seine vor den Mund gehaltenen Hände, atmet den Geruch ein und fällt vor Entsetzen fast um. Nachdem er die Reste des scheinbar unerträglichen Geruchs zu seinen Kollegen gefächelt hat, holt er ein Mundspray hervor und sprüht sich große Mengen davon in den Mund. Immer wieder prüft er das Ergebnis auf die altbekannte Weise. Die Diener rechts und links neben ihm beobachten das Schauspiel und schauen ihn verächtlich an. Als er dies bemerkt, dreht er sich verlegen um und sprüht sich das Spray in einer heimlichen Pose weiter in den Mund. Die anderen beiden Diener schauen sich kopfschüttelnd an und verdrehen die Augen. Unser Diener ist inzwischen fertig mit dem Sprühen und beginnt erneut, die Begrüßungsszene zu üben. Dann hebt er die Hand zum Mund, streckt den Zeigefinger aus und beginnt, sich damit die Zähne zu putzen. Abschließend bearbeitet er die Zahnzwischenräume noch mit dem Fingernagel. Diese Methode scheint nicht auszureichen, um auch die letzten Essensreste zu entfernen. Da kommt ihm eine Idee. Darauf bedacht, nicht ertappt zu werden, schaut er sich verstohlen um und zieht dann einer benachbarten Dienerin unbemerkt einen Baumwollfaden aus der Schürze. Nun wird

klar, was unser Halunke im Schilde führt: Schnell wickelt er sich den ergatterten Faden um die Finger und benutzt ihn in der Funktion von Zahnseide. Wieder schaut ihm sein Nachbar entgeistert zu. Währenddessen löst sich auf scheinbar magische Weise der Schürzenträger seiner Nachbarin. Sie befestigt ihn provisorisch, ohne unseren Diener als Verursacher zu entlarven. Um den ungemütlichen Blicken seines Nachbarn zu entgehen, täuscht unser Diener vor, die Königin sei im Anmarsch, woraufhin sich der andere Diener zur Türe umdreht. Zu allem Übel bleibt unserem Helden jedoch das Garn zwischen den Zähnen stecken. Diesmal ist es die Dienerin die ihm genervte Blicke zuwirft. Mit einem Ruck zieht er den Faden heraus und verzieht schmerzverzerrt sein Gesicht. Plötzlich sieht er bei seinem Nachbarn ein Taschentuch in der Anzugjacke stecken. Erschrocken stellt er fest, dass er selber als einziger Diener kein Reverstaschentuch trägt. Um sich zu behelfen, startet er ein zweites Mal das erprobte Ablenkungsmanöver. Er gibt seinem Nachbarn aufgeregt zu verstehen, dass die Königin komme. Als sich dieser zum Eingang dreht, versucht unser kleiner Gauner, seinem Nachbarn das Tuch aus dessen Reverstasche zu ziehen. Zu seinem Pech ist das Tuch jedoch festgenäht, und der Besitzer schaut ihn erbost an. Daraufhin vertuscht unser Diener seine Gaunerei, indem er vortäuscht das Taschentuch zurechtrücken zu wollen. Zu guter Letzt kommt ihm dann noch die rettende Idee: Er faltet das Programmheft und steckt es mit der weißen Rückseite nach außen in sein Revers. Als nächstes beobachtet er einen Kollegen bei der Fingernagel-Inspizierung. Dabei wird er sich seiner eigenen verschmutzten Nägel bewusst. Also beginnt er, sie mit den Zähnen zu reinigen. Als dies misslingt, sucht er nach einer geeigneteren Möglichkeit. Da fällt sein Blick auf den Reißverschluss seiner Hose. Umständlich wurschtelt er mit den Fingern am Zipper des Reißverschlusses herum. Dabei geht aus Versehen der Reißverschluss auf. In der so entstandenen obszönen Pose dreht er sich zu seinem Nachbarn um. Dieser ist entsetzt und sieht unseren Pechvogel abschätzig von der Seite an. Da betritt die Königin endlich die Halle und alle stehen kerzengerade da. Jeder blickt erwartungsvoll zur Königin, die jeden der Reihe nach einzeln begrüßt. Da entdeckt unser Diener plötzlich seinen noch offenen Hosenschlitz. Er zerrt hektisch an seinem Reißverschluss, der sich partout nicht schließen lässt. Zum Glück ist er der Vorletzte in der Reihe, doch die Königin kommt stetig näher. Als letzten Versuch steckt er schließlich den Finger durch den Hosenschlitz, während die Königin bereits fast vor ihm steht. Da passiert die Katastrophe: Der Reißverschluss lässt sich zwar endlich schließen, doch in seiner Aufregung stößt unser Diener die Königin mit einer übereifrigen Verbeugung zu Boden. Um die beiden herum bricht Chaos aus und jeder ist um die Königin bemüht. Unbeobachtet macht sich derweil der Missetäter aus dem Staub.

Appendix 3

The following information shows the informed consent und participant data information in German, since the study was executed in Germany.

Informed consent

Liebe Probanden aus dem Projekt „Mr Bean“,

Mai, 2013

Sie werden in den nächsten Wochen an mehreren Untersuchungen teilnehmen. Dafür möchten wir Ihnen heute bereits danken. Zusammenfassend werden Ihre Aufgaben folgende Schritte umfassen:

1. Versuch 1: Anhören von vier erzählten Geschichten aus der Reihe „Mr. Bean“
2. Versuch 2: Dasselbe noch mal mit einer kleinen Aufgabe
3. Versuch 3: Ansehen ausgewählter Stummfilme aus der Reihe „Mr. Bean“, dabei sind
4. Versuch 4: Dasselbe noch mal mit einer kleinen Aufgabe
5. Testverfahren: Neuropsychologische Testung der allgemeinen Kognition

Hiermit erkläre ich mich einverstanden, an der geschilderten Untersuchung teilzunehmen. Ich wurde über meine Aufgaben aufgeklärt und weiß, dass die Daten nur anonym behandelt werden. Meine Identität wird ausschließlich der Untersucherin, Laura Fuß und ihrer Betreuerin, Juliane Klann, bekannt.

Ort, Datum _____, _____ Unterschrift _____

Hiermit versichere ich, Laura Fuß, die oben bezeichnete Person über die in der Untersuchung geforderten Aufgaben aufgeklärt zu haben. Ich versichere, dass die Identität des Probanden/der Probandin anonym behandelt werden und ihre/seine Identität ausschließlich mir als Untersucherin und meine Betreuerin, Juliane Klann, bekannt wird.

Ort, Datum _____, _____ Unterschrift _____

Participant data:Probandennummer:

Die unten angegebenen Daten werden vertraulich und anonym behandelt. Nur die Versuchsleiter Laura Fuß und Juliane Klann haben Zugang zu ihnen und sie dienen lediglich dazu, einen bestimmten Probanden bei Bedarf kontaktieren zu können, falls weitere Fragen auftauchen.

Bei der Weiterverarbeitung der Daten für andere Forschungszwecke taucht lediglich die jeweilige Probandennummer auf, so dass eine Anonymisierung garantiert ist.

Name:Schulabschluss:Vorname:Händigkeit:Geschlecht:Geburtsdatum:Telefonnummer:E-Mailadresse:

Bestehen, oder bestanden psychiatrische Erkrankungen (Depressionen, Schizophrenie, etc.)?

Ja Nein

Wenn ja, welche?

Bestehen, oder bestanden neurologische Erkrankungen?

Ja Nein

Wenn ja, welche?

Haben Sie vor Ihrer jetzigen Tätigkeit eine Ausbildung, oder ein Studium im Bereich Linguistik gemacht (Germanistik, Logopädie, etc.)?

Ja Nein

Wenn ja, welche?

Hiermit bestätige ich, dass alle Angaben vollständig und korrekt sind.

Datum/Ort:Unterschrift: