Bachelor thesis

The (in)effectiveness of PDF Reading

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Abstract

This study's aim is to find out whether it makes a difference if expository texts are read from screen (PDF format) or paper. It is hypothesized that reading from paper goes faster than reading from screen and that the participants in the paper reading condition score better on their test(s). The participants were 16 college students from the Netherlands. These students were randomized into four groups. All groups read both texts, though in different order. Group 1 read text one on paper then text two on screen, Group 2 read text two on screen then text one on paper, Group 3 read text one on screen then text two on paper and Group 4 read text two on paper then text one on screen. After each text the students had to answer questions about the respective text to test reading comprehension. Analysis showed contradicting results: text one was read faster from paper, text two from screen. However, these results were not significant. All participants scored better on their tests if the text had been read from paper, though these results were also not significant. Thus, these findings suggest there is no difference between reading from paper or screen.

Keywords: paper, computer, PDF, reading speed, reading comprehension, reading.

Introduction

It seems that more and more books become available online, just as there are more and more developments in handheld devices to read those online books. Reading from screen is becoming a bigger part of our society every day, albeit only because online versions of books are, most of the time, cheaper than their paper equivalents. But is this a good development? Does it make any difference whether a text is read from screen or from paper?

There are some contradicting results when it comes to answering this last question. Therefore it is necessary to look into the literature on this subject known so far. From here on out a couple of researches and their results will be summed up. At the very end, there will be a short summary about what has been stated.

Let's begin with Dillon (1992), who has made a review of the literature on this subject (up to 1992) to consider differences between reading from screen and paper. According to this review, people read a given text about 20-30% slower from a computer screen in contrast to its paper equivalent. He also stated that users did not seem to find reading from screen extra fatiguing. Sustaining the same performance level, however, may be more difficult over time. This problem correlates with the quality of the screen: the worse the quality, the more difficult it will be to sustain the same performance level.

Mayes, Sims & Koonce (2001) also found that reading from screen takes longer than reading from paper. To get to this results, they conducted two experiments. The goal of the first experiment was only to find out whether or not reading from a screen takes longer than reading from paper. Forty participants took part in this study and were randomly assigned to the experimental conditions. The used text was an article from American Scientist of 19 paragraphs long. This article was also scanned into a computer using a high-resolution scanner. The resolution of the image was controlled so that the paper and screen versions were as similar as possible. The paper version was even accommodated with holders to keep

the printed version in the same position. Afterwards participants had to fill out a questionnaire about given text. There was a 25 minute time limit on reading the text, but none on taking the test. This experiment showed that the screen-reading group took longer to finish reading the article, but presentation form had no further effect whatsoever. The second experiment was performed to check if an increase in the demands on working memory was responsible for the slower reading time. An additional 48 participants took part. A portion of the same text as in experiment one was used, only this time they typed it over for the screen-group. The participants were divided over reading condition and working memory load condition. For the working memory load condition participants were presented a list of 10 letters before reading the article, which they had to recall after reading the article (as stated by the authors: "by allocating more resources to a working memory task (such as rehearsal of a word list in the phonological loop) one is increasing the workload of the individual and reducing the ability to do other tasks"). All participants had to fill in the same questionnaire as used in the first experiment afterwards. Mayes et al. (2001) found that there were no significant differences between the screen and paper condition regarding recall of the letters. Reading from screen did give somewhat lower test results (here, only comprehension was tested: the ability to read, process and understand the text).

Noyes and Garland (2003), on the other hand, found in their experiment that study and reading times do not significantly differ per medium. There were 50 participants, who were divided into a computer and a paper group. A page of text with 295 words was used to find reading times. This text was matched in color, polarity, typeface, font size and layout across both conditions. An adapted introductory Economics course was used to test comprehension. They had a total of 20 minutes to study this and had to fill in a 20 question test about this text afterwards. What Noyes and Garland (2003) did find, however, is that the amount of actually learning something from the text (knowing) is higher when the text is read from paper.

In 2004, Garland and Noyes again conducted a study. This time 50 participants took part and were evenly divided over the two conditions (computer and print). Participants had to read an adapted introductory economics course and answer a 20 question essay afterwards and also indicate how they retrieved their answer (Remember, Know, Familiar and Guess). They found that there was no difference in the number of correct answers between the computer and paper group. What they did find, was that the paper condition showed more Know responses, whereas the computer conditions showed more Remember responses. There was no difference found in the amount of Familiar and Guess responses between media.
This kind of goes along with the statement that reading from paper allows one to learn faster than does reading from screen (Garland & Noyes, 2004).

In a study from Wästlund, Reinikka & Norlander (2005) two experiments were executed. In the first experiment, participants had to read PDF-documents which consisted of five different texts of all about a 1000 words. Afterwards, the participants had to fill out a multiple choice test (to test comprehension). In the second experiment, participants had to read newspaper articles, which consisted of about 70 words. Afterwards, they had to think of a suiting headline for each article (also to check for comprehension). The given time for each experiment was limited. In the first experiment, had the text been read from paper, subjects produced more correct answers than their counterparts who read the texts from screen. They also found that the test results were better if read from paper. Additionally, participants in the computer reading condition reported higher levels of stress and became more tired than the participants in the paper reading condition. The computer reading participants also added that it was hard to read the text, because it is bad for the eyes and that it was hard to follow the text in comparison with paper (Wästlund et al., 2005).

Kerr and Symons (2006) also found that test results were better if the text had been read on paper (comprehension). They conducted an experiment among 60 grade five students.

Each participant had to read two expository texts, one on paper one on screen, and was afterwards asked to recall (to directly remember) as much as they could and fill in a questionnaire. They also found that the recall of information, however, was better if the text had been read on screen.

In 2007 Wästlund conducted the same experiment (as in 2005) again, and found once more that participants in the computer reading condition reported higher stress and tiredness ratings. He also noted that there were no significant differences in reading comprehension, and that the scroll page layout had led to a significantly higher mental workload.

Kang, Wang & Lin (2009) have conducted an experiment where the participants had to read an electronic as well as a conventional book. The books consisted of ten novelettes, with an average of 2300 Chinese characters in each novelette. The sequence of novelettes was randomized. After each novelette there were five reading test questions. Both reading speed (by measuring time) and reading accuracy (by means of a test) were measured. Eye fatigue was also measured, by using CFF (critical flicker fusion). A drop in CFF value subsequently meant a decrease in alertness. At the beginning of the reading session, the CFF was measured as a base comparison. They found that reading the conventional book took 178.4 seconds less than reading the electronic book, that reading from paper causes less eye fatigue than reading from screen (which would mainly be caused by the low contrast and resolution of the screen) and that reading efficiency (the better the reading efficiency, the less time you need to understand the message) from reading from screen is lower than that from reading from paper. They also reported that reading accuracy (reading words without mistakes) does not differ between reading from screen or paper.

Ackerman and Goldsmith (2011) as well found that test results were better if the text was read from paper. They conducted two experiments. Experiment one had a fixed study time of seven minutes. Seventy participants took part and were randomly assigned over

screen and paper learning. The used texts were expository and ranged from 1000-1200 words. After reading a text participants had to fill out a 10 question multiple choice test about the text. They found that medium did not make a difference. Experiment two had free regulated study time. Seventy-four participants took part and were randomly assigned to a medium. The same texts and questionnaires were used. They found that the paper learners scored better on their tests.

In a recent study from Connell, Baliss & Farmer (2012) 201 participants were divided between reading from an e-reader or tablet or were to read from paper. The used text was a text with a description of the human heart, followed by four sets of 20 posttest questions. Font type and size, and line spacing were made equal as much as possible, word spacing, however, was not. Reading time and the time it took to complete the posttest were measured. This study showed that those who read from paper took significantly less time to read than those reading from a tablet or e-reader. The results of the posttest were not affected by presentation format (the posttest tested for comprehension).

Daniel and Woody (2012) also found that reading from paper is more time-efficient. They used 298 participants who were randomly assigned to one of these formats: print textbook, printed text pages, printed manuscript in Microsoft Word, electronic PDF file or electronic textbook. Afterwards they had to fill out a 30-question quiz. Participants were observed spending more time reading the electronic media than the paper media. There was no significant difference found in test results (comprehension) or motivation.

Ackerman and Lauterman (2012) conducted two experiments similar to those of Ackerman and Goldsmith (2011), and they found similar results. Eighty participants took part in the first experiment: they had to read five (different) 1000-1200 words text. After each text a 10 question (five for recognition and five for comprehension) multiple choice test was taken. Participants were randomly assigned to one of four conditions (made from: screen or

paper learning and time pressure or free regulation). They found that under time pressure screen learners scored evidently lower than paper learners. When given free time regulation, there was no difference. Experiment 2 was set up to further examine the reason why learning from screen was inferior to paper. Seventy-six participants took part and were randomly assigned to screen and paper learning. The same texts and multiple-choice tests as in Experiment 1 were used. Participants had to study all of them, though in different orders. Afterwards they had to fill out a self-report questionnaire about their preferred medium and perceptions of study effectiveness. They found that there were no significant differences between screen and paper learning under participants who preferred to learn from screen. Among the participants who preferred to learn from paper, however, significant differences between the media were found. The medium preference did not affect reading time.

Now to get back at the initially asked question: Does it make any difference whether a text is read from screen or paper? If you look at reading time, it seems it does. Dillon (1992) noted that reading from a computer screen takes 20-30% longer than reading from paper. Kang et al. (2009); Connell et al. (2012); Mayes et al. (2001); Daniel and Woody (2012); and Kerr and Symons (2006) all found that reading from screen took longer than reading from paper. But, unfortunately, not all empirical studies support this claim. Noyes and Garland (2003) found that reading times did not significantly differ per medium. When it comes to test results Connell et al. (2012); and Wästlund (2007) found no significant differences in reading comprehension per medium. But also on this subject, Noyes and Garland (2003) do not share this opinion; they said that ‘knowing’ the text is better when read from paper. Wästlund et al. (2005); Ackerman and Lauterman (2012); and Ackerman and Goldsmith (2011) as well found that the test results were better if read from paper. Reading from screen is also known to cause more eye fatigue (Kang et al., 2009), what is contradicted by Dillon (1992), who noted that users themselves indicated that reading from screen was not

necessarily more fatiguing. Thus, previous studies do not give a clear answer whether reading from screen or paper is better.

But, because most of the time people spent on computer (or computer-like devices) is actually spent on the internet (and other 'fun stuff'), it is more likely that a text read from screen is not thoroughly read. As Liu (2005) noted: "Younger people do not have the patience to read every word. People are spending more and more time on scanning and skimming, instead of thoroughly reading the entire article." On top of that Ackerman and Lauterman (2012) found that 58% of the participants in a self-report said that they would print a text if it is to be thoroughly learned.

In this study, participants have taken part in a laboratory environment, to limit external influences as much as possible. The material consisted of two texts with the same genre (both expository). Since it was best to keep the texts as close to identical as possible across presentation media, the paper versions were print-outs of the PDF versions that were used with the computer version of the test. After reading the text, participants had to answer either eight or twelve essay question, depending on the read text. Total reading time per text, by keeping time with a stopwatch, was measured and test scores were administered afterwards.

The experiment was organized as a random controlled experiment. The students were randomized into four groups:

- Group 1 started with text one on paper and then had to read text two on screen.
- Group 2 started with text two on screen and then had to read text one on paper.
- Group 3 started with text one on screen and then had to read text two on paper.
- Group 4 started with text two on paper and then had to read text one on screen.

It was hypothesized that (1) reading from paper goes faster than reading from screen and that (2) the participants in the paper reading condition scored better on the tests (after correcting for reading time).

Method

Participants

Sixteen undergraduate college students of different colleges round about Enschede in the Netherlands participated in this study. Age ranged between 18 and 23, with M_{age} = 21.38 years and 68.8% females. They were randomly assigned between four conditions, identified by which text first and which text on computer.

Materials

The two texts dealt with different topics and had a different amount of pages. The texts were chosen as both needed to be expository and associated with one another (thus, both texts were about psychological phenomena). Text one was about the differences between schizophrenia and bipolar disorder and had 2147 words (6 pages); whereas the second text was about flashbulb memory and had 6475 words (15 pages). Both texts were followed by an essay question test (8 questions for the first text, 12 for the second). The amount of questions differed due to one text being longer than the other. It would only seem fair to make fewer questions for a shorter text. There were four different kind of questions asked: Facts ("Give the name under which the mechanism of the FBM is also known."), Concepts ("What symptoms do schizophrenia and bipolar disorder share?"), Definitions ("What is 'Breeding true'?') and Arguments ("Why is the validity problematic when comparing FBMs and memorable first-hand experiences?"). The test was given on paper.

A reliability analysis showed that Cronbach's Alpha, for the first text, could be raised from 0.649 to 0.798 by deleting questions 3 and 8. For the second text, deleting question 10 raised Cronbach's Alpha from 0.676 to 0.755. Question 5 was also removed, since it had zero variance.

The computer displays were 17,1" LCD monitors with a resolution of 1690x1050 pixels. The digitally presented texts were presented as PDF-files, read using Adobe Reader version 11.0.2. (XI) for Windows 7 at a 100% scale. The participants had internet access, but were not allowed to switch to any other internet-based activities while reading. For the paper versions the texts were printed on A4 size paper (210 mm x 297 mm). The font was black, 13 point, Cambria, at 100% scale.

Procedure

The measures were taken in a laboratory environment, to limit external influences as much as possible. All measures were carried out by the author. The students were to read two texts and answer questions about it afterwards.

The participants received an essay-question test when they had read a text. The test consisted of multiple essay questions (8 for text one and 12 for text two).

The procedure was equal for each group. Participants were given a short introduction to inform them about what they had to do. When everything was clear, they could start by reading their first text. Reading time was free, but was also monitored for every text in all four groups. Participants were not allowed to highlight or take notes.

After the participants had finished reading a text they were given the corresponding test, as was explained to them beforehand. All tests were taken on paper and had a 20 minute time limit. The participants were not allowed to look back in the text while answering the

questions. When the participants had finished both reading and filling in the test for the first text, they could start reading their second text and fill in respective test.

The real purpose of the study was not mentioned until debriefing.

Results

Reading time

The mean time to read the first (shorter) text was 967.94s (SD = 289.33). Considering the four conditions, there are four different scores. For the first condition (paper), the mean reading time was 1036.25s (SD = 246.52). For the second condition (also paper), the mean reading time was 875.00s (SD = 331.57). The third condition (computer screen) had a mean reading time of 942.50s (SD = 183.31). And the fourth condition (also computer screen) had a mean reading time of 1018.00s (SD = 438.54). Taken together, the reading time for computer (M = 980.25, SD = 310.93) was slightly longer than the reading time for paper (M = 955.63, SD = 289.05). However, a one-way ANOVA confirmed that this difference was not significant ($p = 0.88$).

The mean time to read the second (longer) text was 2430.75s (SD = 890.26). Considering the four conditions, there are four different scores. For the first condition (computer screen), the mean reading time was 1788.75s (SD = 566.51). For the second condition (also computer screen) the mean reading time was 2529.50s (SD = 972.79). The third condition (paper) had a mean reading time of 2416.00s (SD = 1107.39). And the fourth condition (also paper) had a mean reading time of 2988.75s (SD = 700.91). Taken together, the reading time for computer (M = 2159.13, SD = 769.65) was shorter than the reading time for paper (M = 2702.38, SD = 904.15). However, a one-way ANOVA confirmed that this difference was not significant ($p = 0.32$).

Table 1

Reading time

	Paper		Computer	
	M	SD	M	SD
Text one	955.63*	289.05*	980.25*	310.93*
Text two	2702.38**	904.15**	2159.13**	769.65**

Note. *p=0.88, **p=0.32

Correct responses

First off, the scores were analyzed without compensating for reading time. The mean score for the first (shorter) text was 4.68 points (SD = 5.11). Considering the four conditions, there are four different scores. For the first condition (paper), the mean score was 2.93 points (SD = 2.32). For the second condition (also paper), the mean score was 7.70 points (SD = 7.70). The third condition (computer screen) had a mean score of 4.03 points (SD = 3.25). And the fourth condition (also computer screen) had a mean score of 4.03 points (SD = 6.18). Taken together, the score for computer (M = 4.03, SD = 4.72) was lower than the score for paper (M = 5.32, SD = 5.01). However, a one-way ANOVA confirmed that this difference was not significant (p = 0.62).

The score for the second (longer) text was 6.13 points (SD = 3.12). Considering the four conditions, there are four different scores. For the first condition (computer screen), the mean score was 5.28 points (SD = 5.18). For the second condition (also computer screen) the mean score was 5.58 points (SD = 2.28). The third condition (paper) had a mean score of 5.90 points (SD = 2.62). And the fourth condition (also paper) had a mean score of 7.78 points (SD = 2.15). Taken together, the score for computer (M = 5.43, SD = 3.73) was lower

than the score for paper (M = 6.84, SD = 2.39). However, a one-way ANOVA confirmed that this difference was not significant (p = 0.71).

Table 2

Testscores not compensated for reading time

	Paper		Computer	
	M	SD	M	SD
Text one	5.32*	5.01*	4.03*	4.72*
Text two	6.84**	2.39**	5.43**	3.73**

Note. *p = 0.62 **p = 0.71

Secondly, reading time was taken into account by dividing the scores by reading time. The mean score for the first (shorter) text was 0.0070 points (SD = 0.0122). Considering the four conditions, there are four different scores. For the first condition (paper), the mean score was 0.0030 points (SD = 0.0026). For the second condition (also paper), the mean score was 0.0153 points (SD = 0.0231). The third condition (computer screen) had a mean score of 0.0045 points (SD = 0.0034). And the fourth condition (also computer screen) had a mean score of 0.0050 points (SD = 0.0082). Taken together, the score for computer (M = 0.0048, SD = 0.0058) was lower than the score for paper (M = 0.0092, SD = 0.0129). However, a one-way ANOVA confirmed that this difference was not significant (p = 0.51).

The score for the second (longer) text was 0.0028 points (SD = 0.0018). Considering the four conditions, there are four different scores. For the first condition (computer screen), the mean score was 0.0017 points (SD = 0.0015). For the second condition (also computer screen) the mean score was 0.0037 points (SD = 0.0025). The third condition (paper) had a mean score of 0.0021 points (SD = 0.0012). And the fourth condition (also paper) had a mean

score of 0.0036 points (SD = 0.0012). Taken together, the score for computer (M = 0.0027, SD = 0.0020) was lower than the score for paper (M = 0.0029, SD = 0.0016). However, a one-way ANOVA confirmed that this difference was not significant (p = 0.27).

Table 3

Testscores compensated for reading time

	Paper		Computer	
	M	SD	M	SD
Text one	0.0092*	0.0129*	0.0048*	0.0058*
Text two	0.0029**	0.0016**	0.0027**	0.0020**

Note. *p = 0.51, **p = 0.27

Discussion

It is notable that all test scores were in fact better had the text been read from of paper. This could be explained by Wästlund et al. (2005), who stated that comprehension is better when a text is read from paper. Likewise, Garland and Noyes (2004), and Noyes and Garland (2003) both found that 'knowing' responses were higher had the text been given on paper (computer conditions triggered more 'remember' responses). Also, Wästlund et al. (2005) noted that participants reported higher levels of stress and became more tired had they been reading a text on screen. It was also said that it was harder to follow a text on screen than on paper. Another study found that 58% of the participants in a self-report said that they would print a text if it is to be thoroughly learned (Ackerman and Lauterman, 2012). The fact that text two (the longer one) was read about 10 minutes faster from screen than from paper, could be explained by Liu (2005) who said that younger people do not have the patience to read every word and that people are spending more and more time on scanning and skimming, instead of thoroughly reading the entire article.

For this study it was hypothesized that (1) reading from paper goes faster than reading from screen and that (2) the participants in the paper reading condition scored better on the tests. Unfortunately, both hypotheses are rejected due to all findings being insignificant. This could have had something to do with the setting of the experiment. Though all participants took part in a laboratory environment, this doesn't mean nothing could go wrong. Multiple participants have noted that they constantly heard (continuous) noises. There were even some participants who had to carry out the experiment during rebuilding, which naturally caused a lot of noise. Smith (1991) conducted an experiment where 94 participants were divided between performing in (continuous) noise and performing in quiet. Participants had to carry out a focused attention task and a search task. He found that the main effect of noise was significant and that the participants in the focused attention task became slower when dealing with noise. A questionnaire among Swiss office employees showed that 35% is very much disturbed and 45% is slightly disturbed by noise (only 20% said not to be disturbed by noise at all) (Nemecek & Grandjean, 1973).

Also, almost all participants noted that they found text one (the shorter one) more difficult to read. They stated that even though text two (the longer one) was considerably longer; it was much easier to get trough and more interesting to read. This could have resulted in a bias towards this text, which is notable in the test scores (not compensated for reading time). However, if the test scores are compensated for reading time this doesn't seem to show. The scores on text two (both not compensated and compensated) show lower standard deviations, which could mean that the questions for this text were better understood because the text itself was better understood.

What also happened was that not all participants understood the questions (or wrongly interpreted them), what caused a lot of wrong answers (an example of this: the question "Which measures can hinder that first-hand experiences are quickly forgotten in an

experimental study?", was answered with "Because people are very busy with their studies, which makes them forget things or unable to make some time for this."). Due to the relatively small number of participants (16) this may have caused too small a power. Also, it is difficult to generalize these outcomes to an entire population, since there were only 16 participants.

Conclusion

As found in the literature used in both introduction and discussion, one could say reading from screen uses some kind of different processes than reading from paper. First off, a scroll page layout seemed to led to a significantly higher mental workload, which means it would cost people more effort to read a text from screen than from paper. It also seems that reading from screen is more fatiguing (eye fatigue as well as overall fatigue) and causing more stress. Also, reading from screen made it harder to follow the text. This all points to the fact that the most things read from screen are more likely to be short articles in stead of large (expository) texts. People get more easily distracted if reading from screen and are not used to keeping up the attention for a longer period of time. This matches both (what is already mentioned in both introduction and discussion): People are spending more and more time on scanning and skimming, instead of thoroughly reading the entire article, as well as: 58% of the participants in a self-report said that they would print a text if it is to be thoroughly learned.

In this study no significant differences were found between reading from screen or paper concerning reading time and testscores. According to this, it would seem that reading from screen is just as effective as reading from paper. The introduction already showed that contradicting results were found, for reading time as well as testscores. One could say this matches the results found in this study.

This study can be useful to the emerging research on the use of e-textbooks for student learning at college level since the literature on this subject still is scarce. More

research needs to be done to fully understand this subject. For those future studies, it is recommended to make sure the study takes place in a noise free environment and perhaps test a larger number of participants, so it does not matter whether all participants have understood all questions on the test. It may also be better if both texts are more equal regarding length and use of language.

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Appendix 1: Text one

Schizophrenia and Bipolar Disorder: Differences and Overlaps

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Abstract

If you follow the recent progress in the fields of genetics and neurobiology, you will notice that the validity of the diagnostic distinction between schizophrenia and bipolar disorder is increasingly challenged.
However, recent findings show us that the evidence for basic neurological processes common for both disorders is expanding. This expansion is mainly visible with regard to susceptibility genes, neurodevelopment (for example myelination), and brain functions (for example visuo-spatial achievement).
Recent epidemiological studies also underline the things schizophrenia and bipolar disorder have in common. Unfortunately, it is still difficult to find distinct causal and/or functional differences in entities to really distinguish whether it is schizophrenia or bipolar disorder.

Introduction

The nature of severe mental illness has been under debate for more than a century.
On the one hand, there is the severe long-term disease of which only one disease process is to blame. On the other hand, there are two or more disease processes which are seemingly the same. You can, however, distinguish the processes by cross-sectional symptom patterns and features of long-term course.
The most influential discovery of the last kind was introduced by Kraepelin who distinguished between schizophrenia and manic-depressive illness (Kreapelin's dichotomy). Kreapelin was impressed by the distinctive trademark of both diseases. Schizophrenia has a long-term symptomatic course and an outcome of predominantly lasting symptomatic impairment, whereas bipolar disorder has an episodic course.

Both diseases do have a lot in common though. According to [for instance] the Fourth Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) they share the following symptoms: lifetime prevalence of about 1% in males and females (independent of culture), early age onset (between late adolescence and early adulthood), frequent occurrence in the same families due to genetic influences with very similar recurrence risks of the same disorder among relatives (~10-fold increase in children), and comparable concordance rates for monozygotic and dizygotic twins with heritability estimates of 60-80%.

The fact that both disorders are genetically complex and multiple genes function in combination with (non-genetic) environmental factors has now been accepted everywhere.

During recent decades, arguments in favor of a basic split (between the diseases) were discussed along the following criteria: differential clinical phenomenology and long-term course, differential etiology, differential biological correlates, and differential treatment response.
The evidence that has been collected over the past few decades, have all been supported by the criteria above. For instance, a vast majority of family and twin studies were interpreted in favor of Kreapelin's division.

New methodological approaches, however, showed some new perspectives on this issue of having a strict split. Based on this new perspective, treatment for both disorders became more similar.

Phenomenology and Early Course
Recent follow-up studies focus on the early course and it looks like they show the same results. Weiser et al. (2001) reported that 27% of later schizophrenics were diagnosed with an affective disorder before they got diagnosed with schizophrenia. The most detailed and convincing analysis of the relationship between depression and schizophrenia in the early course of both disorders comes from the Mannheim ABC study (Häfner et al., 2005). Depressive symptoms and syndromes were found to be the first premorbid signs in patients who were later on treated for schizophrenia. Now there is evidence that depression is a risk factor for getting a psychosis among vulnerable patients (Häfner et al., 2005; Krabbendam et al., 2004).

Unfortunately, detailed investigations in the early course of bipolar disorder are missing. There are, however, follow-up studies by Angst, Sellaro, Stassen & Gamma (2005), which suggest a similar structure for bipolar disorder as for schizophrenia. The studies suggest that depressive episodes are an indication of the manic-depressive illness in the majority of cases.

Other risk factors seem less comparable: the first population-wide study in bipolar disorder (Mortensen et al., 2003) did not reveal any factor of significant influence besides family history and early parental loss. Multiple risk factors were obtained for schizophrenia in the same population without any overlap with bipolar disorder (Pedersen & Mortensen, 2001). Another study (Tiihonen et al., 2005) exploring cognitive achievement of military men before getting into the period of risk for both disorders found failures in visuospatial performance as a sign for both disorders. Diagnosis-specific risk factors were also found: good arithmetic reasoning was a sign of bipolar disorder but not of schizophrenia. Altogether, Weiser, Van Os & Davidson (2005) concluded that cognitive limitations prior to both disorders are not specific enough.

Familial and Genetic Risk Factor

Family studies used to be considered as the crucial test for diagnostic validity and differentiated disease processes. Nowadays, genetic association studies play a key role in exploring the causal distinctiveness of diagnostic entities.

Family/Twin Studies

The past few decades, family studies have given the crucial argument for a basic distinction between schizophrenia and bipolar disorder. 'Breeding true' of diagnosis was the ideal. This means that an excess of illness in families of people who suffer from a disorder, should be restricted to diagnosing the original case or a similar syndrome. This view was supported by the majority of reports (for example by Kendler et al. (1993)).

Recently, family and twin studies like to do the opposite and not use breeding true. Although the family history of a specific disorder remains the strongest risk factor, cosegregation (the tendency for closely linked genes and genetic markers to be inherited together) also occurs. This is noticable by an overplus of bipolar disorders among relatives of patients with schizophrenia and the other way around (Maier et al., 2002; Laursen et al., 2005).

The first unrestricted twin study (Cardno et al., 2002) using blinded tests showed that genetic vulnerabilities of schizophrenia and mania were more overlapping than distinct. There were strong genetic components found for schizophrenia (82%) and mania (87%), of which disorder-specific genetic variance justified 33% (schizophrenia) and 19% (mania) of the variances and the shared genetic variance justified 49% (schizophrenia) and 68% (mania) of variances.

Isolates and Cytogenic Abnormalities

Many large tribes who have lived in isolation for many, many years, show a high load of severe mental disorders. With this in mind, it is more common to have a high degree of unspecificity in diagnosing (Blackwood et al., 2001; Maziade et al., 2005) whether it is schizophrenia or bipolar disorder, seeing both disorders 'live together' in the same family.

This pattern is caused by a common underlying susceptibility. This means as much as: mental disorders are not limited to diagnostic boundaries. For example, in an isolated area in eastern Quebec was a region which had both disorders. This region was found next to several diagnosis-specific regions (Maziade et al., 2005).

Abnormalities in the formation of cells occur within both diagnoses. In a Scottish family there was found that a change of location involving chromosomes 1 and 11, was related to both schizophrenia and bipolar disorder (Blackwood et al., 2001).

Much earlier, strong associations were reported between schizophrenia as well as bipolar disorder and a disorder resulting from microdeletions in chromosome 22q (Carlson et al., 1997; Basseett, Chow, Waterworth & Brzustowicz, 2001). Interestingly, the underlying gene is located in an often-reported candidate region for both disorders.

Susceptibility Genes
There have been several positive claims for susceptibility genes for both schizophrenia and bipolar disorder. Some of these overlap and have been said to be associated with both diseases.
In the following years, studies will be able to use more advanced genetic technology and larger sample sizes. Therefore, they will be able to determine if these in fact are true common genetic risk factors.
There are already some genes found to have influence on the revelation of schizophrenia. A few examples are: neuregulin-1 gene on 8p22, dysbindin gene on 6p22, and the G72/G30 gene on 13q32 (Chumakov et al., 2002; Shifman et al., 2002; Straub et al., 2002; Schwab et al., 2003; Stefansson et al., 2002; Fan et al., 2005).

The strongest support for specific susceptibility genes common to schizophrenia and bipolar disorder comes from the G72/G30 gene and the neuregulin-1 gene (for G72/G30: (Hattori et al., 2003; Schumacher et al., 2004), for neuregulin-1: (Green et al., 2005)).
Among the variants of the gene for dopamine-degrading enzyme COMT, the Val-variant has received the most attention up to now. All the evidence together, however, is not convincing for schizophrenia (Fan et al., 2005).

It should be kept in mind that complex behaviors as psychotic and affective disorders are influenced by multiple genes with each of them influencing multiple behavioral components at various physiological functions. On this background it is remarkable that all risk genes identified for schizophrenia and bipolar disorder are involved in the glutamatergic transmission (Collier & Li, 2003) or in the development of neurons and glia cells. These observations point to cross-diagnostic communalities in glutamatergic transmission and neurodevelopment.

Structural Neuroimaging and Neuropathology
Comparisons in measurements of the brain are complicated by a lack of informative studies for bipolar disorder (in contrast to schizophrenia). Schizophrenia is considered a neurodevelopmental disorder with volume reduction of the whole brain and specific areas (particularly, the hippocampus volume). Bipolar disorder reveals some similar volume reductions in areas such as temporal lobe as well as ventricular enlargement, however, less severely. This means that (Bearden, Hoffmann & Cannon, 2001) convincing evidence for

reduction in total brain weight and hippocampus is up to now lacking for bipolar disorder (Geuze, Vermetten & Bremner, 2005).

A recent magnetic resonance imaging (MRI)-volumetric analysis reported white matter volume reductions in the left frontal and temporoparietal regions for both disorders, but different locations of gray matter reductions for each of the disorders under discussion (McDonald et al., 2004). These white matter volume reductions are also observed in post-mortem studies for both disorders (Chambers & Perrone-Bizzozero, 2004). In addition, Tkachev et al. (2003) reported on the downregulation of two key genes for both disorders.
The white matter abnormalities in affected patients in both disorders were not only a sequence of being affected by a specific disorder. They were also present in unaffected relatives, although less severely. Therefore, these abnormalities show vulnerabilities (McDonald et al., 2004).

In both schizophrenia and bipolar disorder, it was concluded that these disorders had caused frontotemporal disconnectivity. A consequence might be cognitive impairments. Those deficiencies were, indeed, found not only in schizophrenia but also in bipolar disorder (McIntosh, Harrison & Forrester, 2005).
The critical period for myelination is the adolescence and early adulthood. Thus, white matter abnormalities might be present before the onset of the disorder and might cause cognitive deficiencies. These were, indeed, observed in children of parents with either of the two diagnoses (McIntosh, Harrison & Forrester, 2005).
Another cross-diagnostic discovery are GABA-ergic interneurons. Their cell density is decreased in schizophrenia as well as in bipolar disorder (Woo, Walsh & Benes, 2004).
Altogether, although the exact same differences in volume between both disorders are rare, several basic processes are shared.

Neuropsychology
As a group, patients with schizophrenia perform poorly on a broad range of neuropsychological tasks. In particular those measuring long-term memory, working memory, attention, and executive functioning (Heinrichs, 2005). Bipolar patients show similar deficits, however, less pronounced. Their declarative memory and executive functioning are often impaired even in the manic state of bipolar disorder (Glahn, Bearden, Niendam & Escamilla, 2004). Abstraction, perceptual motor speed, and vigilance however, are superior compared with schizophrenic patients (Dickerson et al., 2004). Seidman et al. (2002), reported that in a direct comparison, patients with chronic psychotic bipolar disorder had a generally similar pattern of flaws as compared with patients with chronic schizophrenia.

Neuropsychological impairments also characterize vulnerability states. Several recent meta-analyses primarily suggest moderate flaws in verbal memory recall in relatives of schizophrenic patients (Sitskoorn et al., 2004). Studies (McIntosh,

Harrison & Forreseter, 2005; Kieseppa et al., 2005) on relatives of bipolar patients provide less robust results, the most reliable finding is also impaired memory in relatives of bipolar patients.

Conclusion

Evidence suggesting that schizophrenia has causal factors and pathophysiological pathways in common with bipolar disorder is increasing. Overlapping clinical features might be a consequence. Well documented examples are susceptibility genes for neuregulin-1 and G72/G30, which are involved in neurodevelopment, glutamatergic transmission or both.
On a clinical level depression is a precursor in the majority of cases in both disorders. Beyond these shared properties, disease-specific features (as different risk factors and neuropathological features) are also apparent. It can be concluded that the relationship between both disorders does not fit into a precise division as it was originally thought. Currently, several lines of evidence suggest that patients with psychotic features in bipolar disorder are very similar to thoses with schizophrenia, in genetic as well as neurobiological respects. Remodeling of the complex relationship between both disorders will become possible once the relationship between a thorough set of specific susceptibility genes with structure and function of brain systems, as well as with each of the two disorders and their symptoms is clarified.

Appendix 2: Questions text one

Questions about the text.

Your name:
……..

English:
You must now answer a few questions about the text that you just read. There are 12 questions in total. You can use your native language in your answers. If that helps, you can also use English terms. Please be concise in answering the questions. Good luck and thank you!

Nederlands:
Je moet nu een paar vragen over de zojuist gelezen tekst beantwoorden. In totaal zijn er 12 vragen. Je mag in je moedertaal antwoord geven. Als je het makkelijker vind, mag je ook Engelse termen gebruiken. Wees precies in het antwoorden. Veel succes en bedankt!

1. What did Kraepelin discover?

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2. What symptoms do schizophrenia and bipolar disorder share?

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3. Are there any premorbid signs of schizophrenia and/or bipolar disorder?

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4. What is ‘Breeding true’?

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5. What genes give the strongest support for susceptibility genes?

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6. Which white matter areas are reduced when suffering of bipolar disorder?

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7. On what tasks do schizophrenia patients perform poorly?

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8. Do you believe a precise division between schizophrenia and bipolar disorder is possible? (argue)

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English:
Please check that you haven't skipped any questions and that your name is filled in. Next signal the experimenter that you are ready. Thank you for your participation.

Nederlands:
Controleer of je alle vragen hebt ingevuld en of je je naam hebt opgeschreven. Geef de onderzoeker een seintje dat je klaar bent. Bedankt voor je deelname.

Appendix 3: Text two

"Hearing the News" versus "Being There"
David B. Pillemer

1} Brown and Kulik first defined Flashbulb memories (FBMs) as memories of our personal circumstances when first hearing of a very surprising and consequential event.
2} They distinguished FBMs of dramatic public events and FBMs of momentous personal events, such as the death of a parent.
3} There are also memories of first-hand experiences, such as being involved in an automobile accident.
4} Brown and Kulik speculated that the same psychological mechanism accounts for memories of momentous public events and first-hand experiences.
5} FBMs of public events give insights about personal event memory, including the accuracy of eyewitness testimony.
6} I (David Pillemer) will review the key issues. This includes pointing out dissimilarities between FBMs of public events and memories of first-hand experiences.

{ 1 Brown and Kulik (1977) first defined flashbulb memories (FBMs) as "memories for the circumstances in which one first learned of a very surprising and consequential (or emotionally arousing) event", and offered the assassination of President John Kennedy as the "prototype case" (p. 73).

Following Brown and Kulik, scores of researchers have examined *FBMs of public events,* including attacks on, deaths of, or resignations of world leaders (e.g., Christianson, 1989; Conway et al., 1994; Curci, Luminet, Finkenauer, & Gisle, 2001; Finkenauer, Luminet, Gisle, EI-Ahmadi, van der Linden, & Philippot, 1998; Pillemer, 1984), World War II events (Berntsen & Thomsen, 2005), the 1986 explosion of the space shuttle *Challenger* (Bohannon, 1988; McCloskey, Wible, & Cohen, 1988; Neisser & Harsch, 1992), the 1989 California earthquake (Neisser, Winograd, Bergman, Schreiber, Palmer, & Weldon, 1996), and the September 11 attacks on the World Trade Center in 2001 (e.g., Curci & Luminet, 2006; Talarico & Rubin, 2003). This list represents only a fraction of the total number of studies on similar topics.

{ 2 Brown and Kulik (1977) also examined memories of first learning of a "personal, unexpected shock" (p. 79), what could be termed *FBMs of personal events.* Brown and Kulik's instructions to participants guided recall to moments when significant personal news was received, and by far the most common memory theme was learning about the death of a parent. Studies of remembering one's own life circumstances when receiving important private news are rare. With only a few exceptions (e.g., receiving notification of college admission;

Tekcan, 2001), the FBM literature is dominated by large scale surveys of newsworthy public events.

{ 3 Memories that represent circumstances in which one is an active participant rather than a passive recipient could be termed *memories of first-hand experience.* Because first-hand experiences are so diverse and ubiquitous—including car accidents, trauma, birthday celebrations, the first kiss, and scoring the winning goal—there appears to be little added value in using the targeted term "FBM" to describe them.

{ 4 Brown and Kulik (1977, p. 99) speculated that properties of FBMs also characterize recall when the target event is a first-hand personal experience: 'Probably the same 'Now Print!' mechanism accounts both for the enduring significant memories in which one has played the role of central character and those in which one has only been a member of an interested audience of millions." Their speculation about similar underlying memory processes deserves more close and careful scrutiny. { 5 Brown and Kulik's original study of FBMs has inspired books (Conway, 1995; Winograd & Neisser, 1992) and dozens of journal articles. The goal of this work is not simply to examine memories of hearing about the occasional public tragedy. Rather, the purpose is to enrich our understanding of personal event memory, including highly emotional and tragic events that happen to us directly. For example, studies of FBMs have contributed to the debate about the accuracy of eyewitness testimony (e.g., Ceci & Bruck, 1993). Do FBMs of public events provide a useful and valid model of memories of events that happen to us directly, when we are central players?

{ 6 In this chapter I first identify reasons why FBMs of public events, which occur so rarely over the course of one's life, generate such intense scientific interest. Second, I outline potential dissimilarities between FBMs and memories of first-hand experience. Third, I question the validity of global comparisons between these two memory types. Fourth, I describe and evaluate a small set of carefully designed research studies that directly compare memories of news reception events and first-hand experiences.

Why are FBM studies so popular?

7} Brown and Kulik presented FBMs as engaging and provocative phenomena.
8} One reason why FBM studies are prevalent is that researchers can easily find many subjects with FBM memories of major public events.
9} In addition, psychologists who study memory have long focused on accuracy of recall.
10} Brown and Kulik suggest that FBM memory is extraordinarily powerful and unchanging, but their underlying model clearly predicts variations, partly as a result of retellings of the event.

{ 7 Brown and Kulik's (1977) original presentation of FBM was engaging and provocative. They presented a phenomenon that all readers could readily identify in their own personal experience, yet they emphasized its unusual nature: "It is not the memory of the tragic news that invites inquiry, but the memory of one's own circumstances of first hearing the news. There is no obvious utility in such memories" (p. 74). Brown remembered being on the phone with the dean's secretary at Harvard University when he learned that Kennedy had been shot, but his personal circumstances were unrelated to the public news event. Brown and Kulik noted that "there is something strange about this recall" (p. 74), and described their research endeavor as being "on the trail of a mystery" (p. 98).

Although FBMs may be unusual, they are universally recognized. Academic psychologists know that introducing this topic to students, colleagues, or friends invariably triggers a stream of personal testimonials. The concept is so ubiquitous that Gary Larson parodied it in a cartoon with the caption "More facts of nature: All forest animals, to this very day, remember exactly where they were and what they were doing when they heard that Bambi's mother had been shot." In the cartoon, a possum was 'just getting ready to cross the interstate". In short, Brown and Kulik identified a phenomenon that was at the same time common knowledge, compellingly curious, and lacking any scientific explanation— favourable conditions for inspiring empirical study.

{ 8 FBMs are an especially attractive research topic for several reasons. Almost everyone is familiar with the concept and is able to produce a memory on demand, so that potential research participants are plentiful. Following an event like the 2001 attack on the World Trade Center, there is a ready pool of people who have received news of the same public trauma at about the same time. The methodology is straightforward— all that is required is a well constructed questionnaire and a willing group of respondents. The set of target events is always expanding— every new public shock or tragedy provides a unique opportunity to test existing hypotheses. In contrast, it is more challenging to conduct large-scale surveys of the “sundry private shocks in each person's life", because of the "absence of a very large population of like-minded people" (Brown & Kulik, 1977, p. 75).

{ 9 An additional reason why FBM studies are so popular is the intense, almost single-minded scientific interest in the issue of recall accuracy as opposed to other memory functions. Brown and Kulik's provocative title *Flashbulb Memories* and flowery rhetoric suggested the existence of an extraordinarily powerful and unique memory mechanism. They described circumstances under which the "central nervous system will 'take a picture’" (p. 84), and referred to the underlying FBM as "unchanging as the slumbering Rhinegold" (p. 86). { 10 If one looks beyond the rhetoric, Brown and Kulik's theoretical model clearly predicts

variations in narrative memory elaboration, partly as a result of constructive processes accompanying retellings (Pillemer, 1990). Nevertheless, the strongest possible claims about FBMs— that they are unfailingly accurate, complete, and resistant to forgetting (e.g., McCloskey, Wible, & Cohen, 1988)—generated considerable controversy and strong motivation to conduct empirical tests as new public events presented themselves.

"Hearing the News" is not the same as "Being There"

11} Brown and Kulik proposed that FBMs originally held survival value, but present-day FBMs of public events hold no such value.
12} Brown and Kulik speculate that both hearing the news and first-hand experience employ the same memory mechanism, but one difference is the greater consequentiality of traumatic first-hand experiences.
13} Another reason we tend to remember personal circumstances of traumatic first-hand events is that these circumstances are thematically related to the event.

{ 11 Brown and Kulik (1977) proposed that FBMs of first learning about shocking public events reveal a general cognitive mechanism. The mechanism would have survival value because emotional and important events are frequently experienced directly. For first-hand experiences, the surrounding circumstances define the target event and provide important clues about how to respond to similar episodes in the future. Brown and Kulik speculated that for our distant ancestors the appearance of a new and dangerous carnivore would trigger a vivid memory because the correlated information—the precise location where the intruder was spotted, the ongoing activities that could have provoked an attack, and so on—has protective value. In contrast, present-day FBMs of first hearing about distant public events provide no such survival benefits, because the surrounding circumstances—where you were and what you were doing—are unrelated to the substance of the newsworthy occurrence. FBMs of public events simply reflect the automatic activation of a memory mechanism that evolved earlier, for different purposes.

{ 12 Although Brown and Kulik speculated that both hearing the news and first-hand experience are recorded by the same underlying memory mechanism, several dissimilarities are apparent. Consequentiality (personal importance or life impact) of these two types of memory certainly differs in fundamental ways. People who experienced from a distance the resignation of Margaret Thatcher (Conway et al., 1994), the explosion of the space shuttle *Challenger* (Neisser & Harsch, 1992), or the attack on the World Trade Center (Talarico & Rubin, 2003) may rate these events as highly important on a seven-point scale presented in a memory questionnaire, but the perceived *personal* life impact must be of a different order than the shock of an unexpected death of a parent or spouse, a serious accident, or a crime victimization. As a citizen of the US it would be

difficult to rate the *Challenger* explosion, the death of a president, or a terrorist attack as anything other than consequential, but its day-to-day life impact may pale in comparison to first-hand trauma. Shocking public news and traumatic first-hand experience are likely to be rated differently on Berntsen and Rubin's (2006) new Centrality of Event Scale, which includes items such as "I feel that this event has become a central part of my life story" and "This event permanently changed my life".

{ 13 A key difference between first-hand experience and hearing the news is that memories of personal circumstances are related thematically to the target event in the former case only: "Although the fact that an assassination or resignation has occurred may have real consequences for citizens of a given country… the *occasion on which they heard about* it surely does not" (Neisser et al., 1996, p. 353). When thinking or talking about the World Trade Center attacks, memories frequently centre on the newsworthy event itself; personal details come up only when attention is directed specifically to "hearing the news" stories. When thinking or talking about a life-threatening car accident, the personal details are the story (see Curci & Luminet, 2006; Curci, Chapter 1, this volume; and Hirst & Meksin, Chapter 10, this volume).

Because details of first-hand experience are connected in meaningful ways to the target event, the likelihood of gross memory errors or major distortions may be reduced. Brewer (1992) and Neisser and Harsch (1992) attributed some FBM errors to "wrong time slice", in which a reported memory represents a real occurrence but does not capture the very first time a person heard the news. For example, a person who heard fleetingly from a passer-by that an attack on the World Trade Center had occurred, but later on witnessed the full terror on the television news, might retain the memory of the brief and indefinite first telling for a short time only, and later identify the visually shocking television episode as the "first time". In research studies, wrong time-slice errors weaken the test-retest consistency of FBMs because the transient memory of the unremarkable original event is displaced by a completely different but also accurate memory. These substitution errors are less likely to occur for first-hand experiences because personal circumstances help to define the target event: "A person hit by a car may misremember its color, or the day of the week, but will rarely confuse being hit by a car with, say, falling down a mountain" (Schwarz & Gilligan, 1995, p. 22).

14} Furthermore, people tend to mentally rehearse shocking first-hand experiences for directive or protective functions such as avoiding a future accident.
15} Only momentous and consequential FBMs overlap with first-hand experiences in serving social and self roles. For less salient FBMs these functions are much weaker.

16} Connections between memory type and personal well-being are in general strongest for first-hand experiences. This may increase rehearsal and, hence, persistence of first-hand experiences.

{ 14 Differences between recollections of hearing the news and first-hand experience may result in part from differences in rehearsal that occur in the days, months, and years after initial encoding. Memories of shocking first-hand experiences may be thought about and talked about more frequently and with greater intensity than memories of learning about distant public events. Episodes experienced directly may come to mind readily because they contain information that promotes current well-being. For example, memories of first-hand experiences can serve a directive function (Pillemer, 1992, 1998, 2003). As described by Brown and Kulik (1977), vivid and long-lasting memories of dangerous and unsettling events would have survival value because they guide present activities away from similar sources of trouble. A contemporary example involves a recent jog on a sunny day, when a large tree limb unexpectedly fell several yards behind me, triggering a detailed memory of the location and ongoing activity. Months later, whenever I near the same spot on the running path, the memory comes to mind and I approach with caution. Examples of memory directives are plentiful in personal life histories (Pillemer, 1998), and the directive function has been shown empirically to be a prominent component of autobiographical memory (Bluck, Alea, Habermas, & Rubin, 2005). Frequent and focused rehearsal, both overt and covert, should enhance the likelihood that a first-hand memory will be highly elaborated and long lasting, although by no means does it guarantee that the memory will be fully accurate.

In contrast to memories of first-hand experiences, news reception memories would not serve a primarily directive or protective function because their content is unrelated to the distant danger or trauma. { 15 Instead, memories of news reception events appear to enhance interpersonal connection and personal identity, what have been called the social and self functions of autobiographical memory (Bluck, 2003; Bluck, Alea, Habermas, & Rubin, 2005). Neisser (1982) was the first to emphasize the social motivation to create and preserve elaborate FBMs: "We discuss 'how we heard the news' with our friends and listen eagerly to how *they* heard. We rehearse the occasion often in our minds and our conversations, seeking some meaning in it" (p. 48). According to Neisser's account, the self and social functions are entangled. Memories of hearing the news become an integral part of a person's autobiographical narrative, marking critical intersections between an individual's life and the rest of humanity: "we remember the details of a FB occasion because those details are the links between our own histories and 'History'. We are aware of this link at the time and aware that others are forging similar links" (p. 48).

The social and self functions of FBMs would appear to be especially salient when the public event is truly momentous and consequential, such as the Kennedy assassination or the terrorist attacks of September 11, 2001. For newsworthy but less important events, the motivation to incorporate a "hearing the news" memory into the life narrative and to share the memory with others is minimal. For example, FBMs of the assassination attempt on President Reagan, an event that did not have devastating consequences, were rarely rehearsed overtly: most respondents in Pillemer's (1984) study described a FBM 1 month after the shooting but reported never recounting the memory previously. Five years later, McCloskey et al. (1988) found that about 50% of their respondents had memories of the Reagan shooting. The absence of a motive to remember and to share may contribute to FBM decay.

Memories of hearing the news and first-hand experience may differ with respect to the adaptive functions that they serve, but considerable overlap also exists. Memories of first-hand experience not only inform future behaviours and decisions, they also contribute strongly to personal identity and are shared with others to achieve important interpersonal goals. For example, a child's memory of being kidnapped (Terr, 1990) not only contains information about potential dangers to be avoided, it also contributes to his or her evolving sense of self, and sharing memories of the event with others may elicit empathic responses (Pillemer, 2003). Alternatively, a FBM of hearing about a public tragedy provides some guidance about how to respond personally to such episodes in the future. Many adults who provided memories of learning about the assassination attempt on President Reagan reported first thinking about previous assassinations or attempts (Pillemer, 1984). These memories may have offered some reassurance that shocking public events had happened before and that people were able to cope quickly and move forward. { 16 Nevertheless, in most cases connections between specific memory content and personal well-being will be stronger for first-hand events, and this may increase the frequency and purposefulness of rehearsal, and thus the elaborateness and persistence of memories.

This brief comparison of memory types is intended to highlight potential contrasts between hearing the news and first-hand experience. New research, including systematic comparisons of memory functions and rehearsal processes, is necessary to evaluate the speculative conceptual analysis presented here. In the following sections I examine whether existing empirical studies can bring the contrasts into clearer focus.

How valid are Global Assessments of Memory Attributes?

17} One strategy for comparing FBMs and first-hand experiences involves the use of indices of quality such as consistency.
18} A second strategy examines relationships between memory qualities and predictor variables across episodes.

19} The validity and usefulness of global comparisons between FBMs and first-hand experiences are questionable because the latter make up an extremely broad and diverse analytical category.
20} It is hard to draw firm conclusions from the circumscribed body of research on FBMs of public events. One reason is that newsworthy events vary widely in their influence.

{ 17 Two basic strategies exist for comparing memories of hearing the news and first-hand experience. The first involves comparing these two categories of memory with respect to indices of quality, including consistency, elaboration, and persistence. For example, one could assess whether memories of first-hand experiences tend to be more consistent over time than memories of hearing the news. { 18 A second strategy involves identifying relationships between memory qualities and predictor variables (including emotion, surprise, consequentiality, and rehearsal) and then comparing these relationships across episodes of hearing the news and first-hand experience. For example, one could determine if rehearsal is a good predictor of memory consistency for both news reception events and first-hand episodes.

{ 19 The validity and usefulness of global comparisons of memory types based on existing data are questionable because memories of first-hand experience make up an extremely broad and diverse analytical category. Conway (1995) referred to memories of first-hand experiences as "real" FBMs, presumably because they are far more common than memories of hearing the news. "Real" FBMs included "personal" FBMs, such as highly accessible episodes from the first year in college (e.g., Pillemer, Goldsmith, Panter, & White, 1988), and "traumatic" FBMs, such as eyewitness accounts of a crime (e.g., Yuille & Cutshall, 1986). Other researchers have used the term "FBM" to describe topics as diverse as the first menstrual period (Pillemer, Koff, Rhinehart, & Rierdan, 1987) and memories reported by patients in group psychotherapy (Thomsen & Berntsen, 2003). Pillemer (1998) and Rubin and Kozin (1984) identified a wide variety of life events that can give rise to vivid and detailed memories of personal circumstances, including major life turning points, personal injury or accidents, sports triumphs and disappointments, special romantic encounters, and moments of personal insight that have special meaning only for the individual. The task of finding consistent patterns of results within this expansive data set, which can then be compared directly to FBMs of hearing the news, is daunting.

{ 20 Drawing firm overall conclusions about the more circumscribed body of research on FBMs of public events also poses a considerable challenge. Newsworthy events vary widely in their personal, national, and global influence; for example, the assassination attempt on President Reagan in 1981 or the California earthquake of 1989 would appear to be far more limited in scope of impact than the terrorist attacks of September 11, 2001. Outcomes may differ

across studies because the target events are not equally newsworthy or life altering. Although some tentative data patterns are discernible across studies, there is no one agreed upon set of conclusions, or an agreed upon methodology for study design, or an agreed upon standard for evaluating study outcomes. (See Wright, Chapter 2, this volume, and Bentsen, Chapter 9, this volume.)

21} Research examining the *consistency* of FBMs of the space shuttle disaster shows challenges, such as time delays, posed by between-study differences.
22} Research examining *predictors* of FBM consistency, such as intensity of emotional reactions, is challenging because predictors are measured in different ways.
23} A systematic quantitative research review, or meta-analysis, can help us gain knowledge on the impact of these differences.

{ 21 Research examining the consistency of FBMs of the space shuttle disaster provides a good illustration of the challenges posed by between-study differences. McCloskey et al. (1988) examined consistency of FBMs at 1 week and 9 months after the event, using a "relatively lax criterion" (p. 174). Responses given at 9 months to four direct questions involving location, activity, source, and reaction were compared to initial responses and coded as same, more specific, more general, inconsistent, or don't remember. Neisser and Harsch (1992) elicited open-ended and cued memories of the space shuttle disaster within 1 day and again about 2.5 years later. Overall consistency was scored on a seven-point scale. Time 2 responses to the categories of location, activity, and informant were given a score of 2 for "essentially correct, a score of 0 for "obviously wrong", and a score of 1 for "intermediate cases" (p. 17). A "bonus point was awarded depending on the quality of descriptions of two minor" attributes: time of day and others present. Bohannon and Symons (1992) examined consistency using yet another questionnaire design, coding scheme, and time delay. The delay was 3 years and only the category of location was used to evaluate consistency. lt is difficult to come up with a precise estimate of FBM consistency for the space shuttle disaster, let alone for the more expansive FBM literature, in part because methods and time delays differ widely across studies.

{ 22 Researchers also measure predictors of FBM consistency, such as intensity of emotional reactions to the event, in different ways. For example, Neisser and Harsch's (1992) participants answered the open-ended question, "How did you feel about it?" The researchers then converted qualitative responses to scores: respondents who used at least two "strong and negatively toned terms" were assigned a score of 3, those who used one such term were assigned a 2, and those who gave a more neutral or qualified response were assigned a 1. Using this scheme, no effect of emotion on memory was apparent. Bohannon and Symons (1992) directly obtained quantitative emotion ratings on a five-point scale—as

the authors predicted, higher affect ratings were strongly associated with more consistent reports. Substantial between study differences exist even among researchers who employ quantitative ratings: some use three-point scales (e.g., Conway et al., 1994), five-point scales (e.g., Bohannon & Symons, 1992; Pillemer, 1984), seven point scales (e.g., Curci & Luminet, 2006; Neisser et al., 1996; Talarico & Rubin, 2003), and eleven-point scales (Christianson, 1989). The scales have a variety of verbal anchors. Using different measurement metrics could contribute to between-study differences in outcomes. (See Curci, Chapter 1, this volume.)

It is hard to determine the precise effect of methodological differences between studies, but it would be a mistake to discount their importance and base comparisons primarily on researchers' summary conclusions (e.g., whether the data are interpreted as supporting a claim of memory consistency or inconsistency). { 23 The growing scientific literature on FBMs seems ripe for a systematic quantitative research review or meta-analysis (e.g., Cooper & Hedges, 1994; Light & Pillemer, 1984). In the case of memory consistency, for example, all studies that have assessed this quality would be included in the analysis. Consistency rates would be entered with key study characteristics to determine if consistency scores vary systematically as a function of coding strategy, time delay (e.g., Schmolck, Buffalo, & Squire, 2000), age of participants (e.g., Conway et al., 1994), and other possible sources of outcome differences.

Direct Comparisons of Hearing the News and First-Hand Experience

24} One way to avoid ambiguities in methodology of between-study differences is to conduct direct comparisons within studies.
25} Rubin and Kozin made direct comparisons by using different *techniques* such as open-ended probes and specific memory cues.
26} Later research employed two different *methods*: Comparing memories from direct or indirect exposure to the same event and comparing memories for a newsworthy and a mundane event that occurred at about the same time.

{ 24 One way to avoid ambiguities associated with between-study differences in methodology is to conduct direct comparisons within studies. In this way, researchers can ensure that methods are consistent across event types. A handful of studies have included memories of both hearing the news and direct experience (Christianson, 1989; Er, 2003; Neisser et al., 1996; Rubin & Kozin, 1984; Talarico & Rubin, 2003; Weaver, 1993).

{ 25 Early in the history of FBM research, Rubin and Kozin (1984) recognized the need for comparative analyses. They elicited college students' three "clearest memories". Participants were given a definition of FBMs to guide their recall. The open-ended probes produced a variety of event types, such as accidents, sports

events, encounters with members of the opposite sex, and deaths. Vivid memories overwhelmingly described first-hand experiences; spontaneous descriptions of news reception events were rare (4 of 174 memories). The extremely low incidence of memories of hearing the news could be attributable in part to the immediate historical context of the data collection in 1982; college students would not have been exposed recently to a major public tragedy.

Rubin and Kozin (1984) also provided specific memory cues for 20 events. Probes for first-hand experiences included receiving an admissions letter to college, a car accident, the seventeenth birthday, and the first date. Probes for hearing the news events included the shootings of President Reagan, the Pope, and President Sadat of Egypt, as well as President Nixon's resignation. Several of the first-hand experiences were identified by most students as producing flashbulb-quality memories: a car accident that they were in or witnessed, the night of the senior prom, meeting your college roommate for the first time, and speaking in front of an audience, among others. The public event that produced the highest incidence of exceptionally vivid memories was the assassination attempt on President Reagan (50%); proportions of other memories of hearing the news that were rated as flashbulb quality were well below 50%. The relatively low percentage of people reporting FBMs of newsworthy events may be attributable in part to the absence of recent public tragedies that were perceived as truly momentous.

{ 26 Following Rubin and Kozin (1984), researchers have employed two principal strategies to compare FBMs of newsworthy events and memories of first-hand experiences: (1) comparing memories representing direct versus indirect exposure to the same momentous event (Er, 2003; Neisser et al., 1996) and (2) comparing memories of hearing about newsworthy events to memories of unrelated mundane personal events that had occurred at about the same time (Christianson, 1989; Talarico & Rubin, 2003; Weaver, 1993).

27} Neisser, comparing direct and indirect exposure to the same event, provides strong evidence that first-hand experiences can be remembered for years.
28} Both Neisser and Er conclude that memories of momentous first-hand experiences which serve a protective and social function lead to rehearsal and, hence, retention.
29} Talarico and Rubin found no difference between a newsworthy event and a mundane event. But their research design caused subjects to focus special attention on the everyday event.

{ 27 Using the first research strategy, Neisser et al. (1996) obtained memories of personal circumstances when learning about the Loma Prieta or "San Francisco" earthquake of 1989, famous for its postponement of the baseball World Series.

Direct versus indirect participation was a critical variable. Some college student respondents were Californians who felt the tremors themselves and therefore could provide a memory of first-hand experience. Other students lived in Atlanta and provided a memory of hearing the news. Memories were obtained days after the event and again 1.5 years later. Consistency was scored using a modified version of Neisser and Harsch's (1992) three-point scale (consistent, partly consistent, inconsistent). Comparisons between samples focused on a score composed of three central informational categories: location, activity, and others present.

Between-sample differences in memory consistency were dramatic and revealing. Californian students' responses were almost perfectly consistent over the 1.5 year time interval, with performance "essentially at ceiling" (Neisser et al., 1996, p. 345). In contrast, Atlanta students' memories of hearing the news showed substantial evidence of inconsistencies. In Atlanta, memories of students who had relatives and friends in the affected area were far more consistent than memories of students who *did not*. Other studies also have found high FBM consistency among respondents who had strong interest and personal investment in the target event (e.g., Conway et al., 1994). Neisser et al. (1996) concluded that "recall can be accurate, even if it takes an earthquake to make it so" (p. 356).

{ 28 Neisser et al. (1996) provided strong evidence for the idea that first-hand experiences may be remembered vividly and consistently for months and years. The authors speculated that rehearsal may play a key role in memory preservation. Narratives that portray a "how I didn't die story" illustrate the directive and social functions of recalling first-hand experiences: "Nearness to real danger gives such stories a distinctiveness that few accounts of 'hearing the news' can match" (p. 356). In contrast, the Atlanta students were a continent away from danger, and would not be strongly motivated to think about and share their personal memories, with the exception of respondents who had Californian friends and relatives.

Er (2003) conducted a study similar in design to the study by Neisser et al. (1996). Turkish participants who directly experienced the 1999 Marmara earthquake were compared to participants who only heard the news. Memory was assessed by a questionnaire administered 6 to 9 months after the earthquake and again 6 months later. Victims of the earthquake were more likely than people who heard the news indirectly to have detailed and vivid memories. Memories reported by on-site victims were more consistent than memories reported by participants who experienced the event indirectly; consistency scores for victims were virtually at ceiling. The authors concluded that FBM inconsistencies observed in prior studies may be attributable to the fact that participants "were not directly affected by the events" (p. 515).

{ 29 Talarico and Rubin (2003) used a different strategy to examine FBM consistency. They compared FBMs of the September 11 terrorist attacks to memories of an ordinary personal event; both memories were obtained 1 day after September 11 and again 1, 6, or 32 weeks later. College students were asked direct questions about September 11, including the categories of informant, time, location, others present, and activity. A second set of questions involved "an everyday event from the participant's life in the days prior to the attacks" (p. 455). Everyday events reported by college students were "typical for the life of an average college student", and included parties, sporting events, and studying (p. 456). As such, they qualify as first-hand experiences. Direct questions included type of event, time of occurrence, location, others present, and activity. Students listed several words that could be used to cue the particular everyday memory in a future testing. They also completed the Autobiographical Memory Questionnaire for both the September 11 memory and the everyday memory; the questionnaire asks participants to provide ratings of a variety of memory features.

Memory consistency was assessed using relatively soft criteria. For example, when describing others who were present, the Time 1 response "friend" and Time 2 response "Sue" were scored as consistent (p. 456). Everyday memories and FBMs showed similar levels of consistency across time periods. FBMs were rated as more emotional and were rehearsed more frequently than were everyday memories, but these qualities did not lead to greater consistency.

Talarico and Rubin's (2003) main finding— that memories of unremarkable everyday events appear to be as consistent as memories of a shocking public disaster—is so striking that it deserves careful scrutiny. One issue concerns the uniqueness of self-selected events. Everyday events singled out by participants appear to represent particular instances of recurrent activities of a typical college student. A memory of studying in the dorm, for example, may have several scripted components (location-dorm room; activity-studying; time-after dinner) that would remain consistent using soft scoring criteria, even if the original event is not remembered vividly.

A second issue involves the classification of the self-nominated events as "everyday". Participants singled out an event to be included in a formal psychological study. Then they answered a series of questions about it and completed the Autobiographical Memory Questionnaire with this particular event in mind. The event may have been ordinary to begin with, but after this focused rehearsal it would appear to have lost its casual, everyday status. In addition, the request for words to "serve as a cue for that unique event in the future" (p. 456), although necessary for follow-up testing, seems to suggest to the participant that the memory could or would be requested again at a later date.

30} Weaver also showed that research subjects can be influenced to remember everyday events.
31} Christianson showed that without elaborative rehearsal, special cueing, or a request to remember, everyday memories are susceptible to rapid decay.
32} Talarico and Rubin's and Weaver's findings may illustrate the power of event distinctiveness, rehearsal, and motivated remembering
33} While memories of public tragedies are less robust than memories of momentous first-hand events, they are still well remembered. This is probably because memories of public tragedies are distinctive and because we are very likely to rehearse them.

{ 30 An earlier study conducted by Weaver (1993) produced a pattern of findings similar to those reported by Talarico and Rubin (2003). As part of a classroom exercise in cognitive psychology, college students were told that "the next time they saw a roommate (or a friend, if they lived alone), they should do their best to remember all the circumstances surrounding that event" (p. 41). By chance, the 1991 bombing of Iraq began at about the time that the classroom exercise was conducted, and memory questionnaires were completed for both the roommate interaction and hearing the news of the bombing. Follow-up questionnaires were administered 3 months and 11 months later. Memory consistency over time for the two events was similar, with only scattered differences favouring memories of hearing about the public event. The author provided a motivational explanation for the persistence of ordinary memories involving a roommate: "What does appear to be necessary is having the instructions (or intentions) to remember the event" (p. 45).

{ 31 Christianson's (1989) earlier comparison of a FBM and a personal memory suggests that, in the absence of elaborative rehearsal, special cueing, or a request to remember, everyday memories are susceptible to rapid decay. Christianson obtained memories of hearing about the assassination of Swedish Prime Minister Olof Palme 6 weeks after the shooting and again 1 year later, and compared them to respondents' most vivid memory from the Saturday before the first interview. Participants were unaware at Time 1 that they could be contacted again in the future. The personal memory was elicited at Time 2 with a request for a memory of "the event you described from the last Saturday before we called you the first time" (p. 437). The average memory consistency rate for personal circumstances (informant, time of day, location, activity, others present, clothes worn, first thoughts) when learning about the Palme assassination was .80 using soft scoring criteria. Memories of the personal event were scored as consistent if the second memory "included a general description of the same event, regardless of what specific details were mentioned" (p. 439); the consistency rate was only .22. The authors concluded that "the Palme-related circumstances were much better retained than the personal event" (p. 439). Part of the very large difference in

consistency rates for memories of the newsworthy event and the personal event could be due to differences in directed rehearsal during the Time 1 interview; participants responded to specific questions and provided ratings only for their memories of the Palme assassination.

{ 32 Rather than demonstrating the ordinariness of FBMs, Talarico and Rubin's (2003) and Weaver's (1993) findings may illustrate the power of event distinctiveness, rehearsal, and motivated remembering. When an everyday event is singled out for special attention and detailed analysis as part of a research study, it is likely to persist for months with a good degree of consistency. { 33 Distinctiveness and rehearsal were identified early on by Rubin and Kozin (1984) as likely contributors to memory vividness, and the recent data further underscore their potential importance. In contrast, FBM processes are more automatic; momentous events are distinctive, talked about, thought about, and vividly remembered in the absence of an intervention by a researcher. Although FBMs of hearing about public tragedies may well be less robust than memories of momentous first-hand experiences (Er, 2003; Neisser et al., 1996), it would be premature to equate them with memories of the multitude of mundane and recurring events in our lives.

Appendix 4: Questions text two

Questions about the text.

Your name:
……..

English:
You must now answer a few questions about the text that you just read. There are 12 questions in total. You can use your native language in your answers. If that helps, you can also use English terms. Please be concise in answering the questions. Good luck and thank you!

Nederlands:
Je moet nu een paar vragen over de zojuist gelezen tekst beantwoorden. In totaal zijn er 12 vragen. Je mag in je moedertaal antwoord geven. Als je het makkelijker vind, mag je ook Engelse termen gebruiken. Wees precies in het antwoorden. Veel succes en bedankt!

1. Briefly define the term Flashbulb memory.

……
……
……
……

2. Which goals does the author try to achieve with the text?

……
……
……
……
……

3. Which two kinds of FBMs are mentioned in the text?

……
……

4. What are the two most important differences between memorable FBMs and memorable First-Hand Experiences?

……
……
……
……
……

5. Give the name under which the mechanism of the FBM is also known.

……
……

6. Why is the validity problematic when comparing FBMs and memorable first-hand experiences?

……
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……
……
……
……

7. What example is mentioned in studies on the consistency of FBMs?

……

8. Which factors are commonly mentioned under the rubric of the circumstances of a memorable event?

……
……
……
……
……

9. Rubin and Kozin asked students to mention their three most memorable events from a list with two types of memories. Which memory type yielded the

clearest recollection?

……
……

10. Which functions help in memorizing an event?

……
……
……
……
……

11. Give two reasons why people sometimes remember common first-hand experiences just as well as memorable FBMs.

……
……
……
……
……

12. Which measures can hinder that first-hand experiences are quickly forgotten in an experimental study?

……
……
……
……
……
……
……

English:
Please check that you haven't skipped any questions and that your name is filled in. Next signal the experimenter that you are ready. Thank you for your participation.

Nederlands:
Controleer of je alle vragen hebt ingevuld en of je je naam hebt opgeschreven. Geef de onderzoeker een seintje dat je klaar bent. Bedankt voor je deelname.

Appendix 5: Informed consent

GEÏNFORMEERDE TOESTEMMING

Ik, …….. (*naam proefpersoon)*

Stem toe mee te doen aan een onderzoek dat uitgevoerd wordt door

Marjolein Heij onder leiding van dr. H. van der Meij

Ik ben me ervan bewust dat deelname aan dit onderzoek geheel vrijwillig is. Ik kan mijn medewerking op elk tijdstip stopzetten en de gegevens verkregen uit dit onderzoek terugkrijgen, laten verwijderen uit de database, of laten vernietigen.

De volgende punten zijn aan mij uitgelegd:

1. Het doel van dit onderzoek is inzicht te krijgen in de ontwikkeling van tekstbegrip.
2. Er zal mij gevraagd worden een (studie)tekst te lezen.
   Aan het einde van het onderzoek zal de onderzoeker uitleggen waar het onderzoek over ging.
3. Er behoort geen stress of ongemak voort te vloeien uit deelname aan dit onderzoek.
4. De gegevens verkregen uit dit onderzoek zullen anoniem verwerkt worden en kunnen daarom niet bekend worden gemaakt op een individueel identificeerbare manier.
5. De onderzoeker zal alle verdere vragen over dit onderzoek beantwoorden, nu of gedurende het verdere verloop van het onderzoek.

Handtekening onderzoeker: …… Datum: ……..

Handtekening proefpersoon: …… Datum: ……..

Appendix 6: Participants instruction

.... 2014

Proefpersonen Instructie

Je zult straks mee gaan doen aan een onderzoek naar de ontwikkeling van tekstbegrip.

Dit onderzoek duurt ongeveer 2 uur. In deze twee uur zul je twee teksten te lezen krijgen en daarover vragen moeten beantwoorden. Eerst zul je de eerste tekst krijgen en als je deze uitgelezen hebt krijg je de bijbehorende vragen. Daarna volgt hetzelfde principe voor de tweede tekst. De leestijd per tekst zal worden bijgehouden. Voor het beantwoorden van de vragen heb je ongeveer 20 minuten per vragenlijst.

Je verdient door deelname aan dit onderzoek 2 proefpersoonpunten die via het Sona-systeem wordt opgeslagen.

Het is belangrijk dat je probeert **goed** te lezen. Het is dus niet de bedoeling dat je het lezen gaat afraffelen. Je mag **geen** aantekeningen maken.

Lees zoals je dat gewend bent. Als je uitgelezen bent, meld je je bij de proefleider. Zij zal je een aantal vragen over de tekst geven. Deze dien je zo goed mogelijk te beantwoorden.

Als er iets niet duidelijk is, meld je dan even bij de proefleider. Als je de tekst **al kent**, laat het de proefleider dan weten.

Alvast bedankt voor het meedoen!

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Appendix 7: Codebook text one

Scoring

Total of 8 items.
Maximum test score = 20 points.

Item	Type Question	Score
1	Fact	2
2	Concept	4
3	Fact	2
4	Definition	1
5	Fact	2
6	Fact	2
7	Fact	4
8	Argument	3

1. **What did Kraepelin discover?** *(maximum 2 points)*
   - Kraepelin distinguished between schizophrenia and manic-depressive illness (Kreapelin's dichotomy). → *1 point*

     or

   - Schizophrenia has a long-term symptomatic course and an outcome of predominantly lasting symptomatic impairment, whereas bipolar disorder has an episodic course. → *2 points*

2. **What symptoms do schizophrenia and bipolar disorder share?** *(maximum 4 points)*
   - Lifetime prevalence of about 1% in males and females (independent of culture); → *1 point*
   - Early age onset (between late adolescence and early adulthood); → *1 point*
   - Frequent occurrence in the same families due to genetic influences with very similar recurrence risks of the same disorder among relatives (~10-fold increase in children); → *1 point*
   - And comparable concordance rates for monozygotic and dizygotic twins with heritability estimates of 60-80%. → *1 point*
   -
3. **Are there any premorbid signs of schizophrenia and/or bipolar disorder?** *(maximum 2 points)*
   - Depression for schizophrenia. (Later schizophrenics were diagnosed with an affective disorder before they got diagnosed with schizophrenia.
     or: Depressive symptoms and syndromes were found to be the first premorbid signs in patients who were later on treated for schizophrenia.
     or: Now there is evidence that depression is a risk factor for getting a psychosis among vulnerable patients. → *1 point*
   - None for bipolar disorder. (Unfortunately, detailed investigations in the early course of bipolar disorder are missing.)
     or: Depression for bipolar disorder (The studies suggest that depressive episodes are an indication of the manic-depressive illness in the majority of cases.) → *1 point*

   - Depression for both. → *2 points*

4. **What is 'Breeding true'?** *(maximum 1 point)*

'Breeding true' of diagnosis was the ideal. This means that an excess of illness in families of people who suffer from a disorder, should be restricted to diagnosing the original case or a similar syndrome. → *1 point*

5. **What genes give the strongest support for susceptibility genes?** *(maximum 2 points)*
   - The G72/G30 gene; → *1 point*
   - And the neuregulin-1 gene. → *1 point*

6. **Which white matter areas are reduced when suffering of bipolar disorder?** *(maximum 2 points)*
   - The left frontal and; → *1 point*
     (- Frontal lobe → *0,5 point*)
   - Temporoparietal regions. → *1 point*

     or

   - Temporal lobe → *1 point*

7. **On what tasks do schizophrenia patients perform poorly?** *(maximum 4 points)*
   - Those measuring long-term memory; → *1 point*
   - Working memory; → *1 point*
   - Attention, and; → *1 point*
   - Executive functioning. → *1 point*

   - A broad range of neuropsychological tasks. → *0,5 point*

8. **Do you believe a precise division between schizophrenia and bipolar disorder is possible? (argue)** *(maximum 3 points)*
   One point for anything listed below. These facts do not need to be cited, it must, however, show that the participant knows what he/she is talking about.

   - It is still difficult to find distinct causal and/or functional differences in entities to really distinguish whether it is schizophrenia or bipolar disorder. → *0,2 point*
   - Schizophrenia has a long-term symptomatic course and an outcome of predominantly lasting symptomatic impairment, whereas bipolar disorder has an episodic course. → *0,2 point*
   - *Argument containing something out of* : "They share the following symptoms: lifetime prevalence of about 1% in males and females (independent of culture), early age onset (between late adolescence and early adulthood), frequent occurrence in the same families due to genetic influences with very similar recurrence risks of the same disorder among relatives (~10-fold increase in children), and comparable concordance rates for monozygotic and dizygotic twins with heritability estimates of 60-80%." → *0,2 point*
   - A vast majority of family and twin studies were interpreted in favor of Kreapelin's division. → *0,2 point*
   - Depression is a premorbid sign for both disorders. → *0,2 point*
   - Failures in visuospatial performance as a sign for both disorders. → *0,2 point*
   - Good arithmetic reasoning was a sign of bipolar disorder but not of schizophrenia. → *0,2 point*
   - Cosegregation (the tendency for closely linked genes and genetic markers to be inherited together) also occurs. This is noticable by an overplus of bipolar disorders among relatives of patients with schizophrenia and the other way around. → *0,2 point*

- Genetic vulnerabilities of schizophrenia and mania were more overlapping than distinct. → *0,2 point*
- It was found that a change of location involving chromosomes 1 and 11, was related to both schizophrenia and bipolar disorder. → *0,2 point*
- Schizophrenia and bipolar disorder share some of the same susceptibility genes. → *0,2 point*
  (- G72/G30 gene and the neuregulin-1 gene. → *0,2 point*)
- All risk genes identified for schizophrenia and bipolar disorder are involved in the glutamatergic transmission or in the development of neurons and glia cells. → *0,2 point*
- GABA-ergic interneurons cell density is decreased in schizophrenia as well as in bipolar disorder. → *0,2 point*
- *Argument containing something out of:* "Schizophrenia is considered a neurodevelopmental disorder with volume reduction of the whole brain and specific areas (particularly, the hippocampus volume). Bipolar disorder reveals some similar volume reductions in areas such as temporal lobe as well as ventricular enlargement, however, less severely. This means that (Bearden, Hoffmann & Cannon, 2001) convincing evidence for reduction in total brain weight and hippocampus is up to now lacking for bipolar disorder (Geuze, Vermetten & Bremner, 2005).
  A recent magnetic resonance imaging (MRI)-volumetric analysis reported white matter volume reductions in the left frontal and temporoparietal regions for both disorders, but different locations of gray matter reductions for each of the disorders under discussion (McDonald et al., 2004)." → *0,2 point*
- *Argument containing something out of*: "As a group, patients with schizophrenia perform poorly on a broad range of neuropsychological tasks. In particular those measuring long-term memory, working memory, attention, and executive functioning (Heinrichs, 2005). Bipolar patients show similar deficits, however, less pronounced. Their declarative memory and executive functioning are often impaired even in the manic state of bipolar disorder (Glahn, Bearden, Niendam & Escamilla, 2004). Abstraction, perceptual motor speed, and vigilance however, are superior compared with schizophrenic patients (Dickerson et al., 2004). Seidman et al. (2002), reported that in a direct comparison, patients with chronic psychotic bipolar disorder had a generally similar pattern of flaws as compared with patients with chronic schizophrenia." → *0,2 point*

- Lots in common. → *0,1 point*
- Lots of differences. → *0,1 point*

Appendix 8: Codebook text two

Codeboek voor scoren van test resultaten

QSS = QuikScan Summary (bv. QSS 1.3 = QuikScanSummary # 1, text reference 3)
SA = Structured Abstract

In het algemeen scoor je het best door eerst het antwoord in het geheel te lezen en daarna te zoeken naar de aanwezigheid van specifieke trefwoorden. Bij enkele vragen (bijv. 3) wordt per antwoord onderscheid gemaakt tussen een concept (abstracte formulering) en een voorbeeld (concreet). De score voor deze twee soorten antwoorden zijn anders. Een antwoord met een concept waardeer je hoger dan een voorbeeld. Meestal is een concept 1 punt, terwijl een voorbeeld 0.5 punt is. Als concept en voorbeeld over hetzelfde aspect gaan, scoor je alleen de hoogste waarde (max 1 punt).

De antwoordsleutel begint altijd met het juiste antwoord. Daaronder staan voorbeelden die aangeven hoe je kunt scoren:

P = Prototype voorbeeld (heel typisch, eenduidig)
T = Twijfelgeval (wel geldig, maar niet eenduidig)
Ook de vindplaats van het antwoord in de samenvattingen staat aangegeven. Dit is niet van belang voor het scoren.

Code voor elk item:
O = fout antwoord of niet ingevuld
1 = goed antwoord

Antwoordsleutel

1. Geef een korte definitie van de term Flashbulb memory (3 punten)

- **A)** geheugen van persoonlijke omstandigheden → *1 punt*
- **B)** bij het *voor het eerst* vernemen →*1 punt*
- **C)** van een verrassende en invloedrijke gebeurtenis →*1 punt*

Voorbeelden

- **A)** geheugen van persoonlijke omstandigheden → *1 punt*
  => **P:**
  =>**T:** Het onthouden van de plaats waar je was, met wie je was en wat je deed… (#15)

- **B)** bij het *voor het eerst* vernemen →*1 punt*
  => **P:**
  => **T:**

- **C)** van een verrassende en invloedrijke gebeurtenis →*1 punt*
  => **P:** schokkende gebeurtenis (#5), belangrijke gebeurtenis (#6)
  => **T:** Het onthouden van… op het moment dat er iets "groots" gebeurde. (#15)

Items: T1a, T1b, T1c
T1a, T1b, T1c aanwezig in SA – background
T1a, T1b, T1c aanwezig in QSS – 1.1

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2. Beschrijf kort de belangrijkste doelen van de tekst (2 punten)

- **A)** Look if FBMs and FHEs have the same underlying processes / if FBMs provide a model of FHEs. *(QSB 1.6, QS 5 en QS6)→ 1 punt*
- **B)** Identify reasons why FBMs generate such intense scientific interest / explain the popularity of FMBs. *(QSB 1.6, QS6 → 1 punt*
- **C))** Examine FBMs. *(QS5)→ 0,4 punten*

- **D)** Enrich understanding of personal event memory, including FHEs. *(QS5)→ 0,4 punten*
- **E)** Outline potential dissimilarities between FBMs and FHEs. *(QSB 1.6, QS6) → 0,4 punten*
- **F)** Question the validity of global comparisons between FBMs and FHEs. *(QS5 → 0,4 punten*
- **G)** Describe and evaluate studies (that compare FBMs and FHEs). *(QS6) → 0,4 punten*

Voorbeelden

- **A)** Look if FBMs and FHEs have the same underlying processes / if FBMs provide a model of FHEs. *(QSB 1.6, QS 5 en QS6)→ 0,5 punten*
  => **P:**
  => **T:** Onderzoeken of het horen van nieuws hetzelfde is als de gebeurtenis waar het om gaat meemaken. (#5)

- **B)** Identify reasons why FBMs generate such intense scientific interest / explain the popularity of FMBs. *(QSB 1.6, QS6 → 0,5 punten*
  => **P:**
  => **T:**

- **C))** Examine FBMs. *(QS5)→ 0,2 punten*
  => **P:** Een beschrijving van het FBM verschijnsel geven. (#16)
  => **T:**

- **D)** Enrich understanding of personal event memory, including FHEs. *(QS5)→ 0,2 punten*
  => **P:**
  => **T:** De lezer informeren over FBM. (#17)

- **E)** Outline potential dissimilarities between FBMs and FHEs. *(QSB 1.6, QS6) → 0,2 punten*
  => **P:**
  => **T:** First-hand memories en FBM met elkaar vergelijken. (#17)

- **F)** Question the validity of global comparisons between FBMs and FHEs. *(QS5 → 0,2 punten*
  => **P:**
  => **T:**

- **G)** Describe and evaluate studies (that compare FBMs and FHEs). *(QS6) → 0,2 punten*
  => **P:**
  => **T:**

Items: T2a t/m T2g

T2a, T2b aanwezig in SA – aim
T2a, aanwezig in QSS – 1.4
T2d, aanwezig in QSS – 1.5
T2e, aanwezig in QSS – 1.6

---

3. Welke twee soorten FBMs worden er genoemd in de tekst? (2 punten)

- **A1) Concept**. FBMs of public events→ *1 punt*
- **A2) Voorbeeld.** omschrijving van public events (bv. Hearing the news)→ *0,5 punten*

- **B1) Concept.** FBMs of personal events→ *1 punt*
- **B2) Voorbeeld.** hearing the news of death in a car accident of parents → *0,5 punten*

Voorbeelden

- **A1) Concept**. FBMs of public events→ *1 punt*
  => **P:** naar aanleiding van publieke gebeurtenissen (#16)
  =>**T:**
- **A2) Voorbeeld.** omschrijving van public events (bv. Hearing the news)→ *0,5 punten*
  => **P:** Dingen die je hoort bv op het nieuws, maar die je niet zelf ervaart. (#15)
  => **T: (**inter) nationale (#14)

- **B1) Concept.** FBMs of personal events→ *1 punt*
  => **P:** persoonlijke gebeurtenisse (#16)
  => **T:**
- **B2) Voorbeeld.** omschrijving van personal events, hearing the news → *0,5 punten*
  => **P:** FBM als je het via via hoort (hearing the news) (#6)
  => **T:**

Items: T3a1 T3a2 T3b1 T3b2
T3a1, T3a2 aanwezig in SA – results
T3a1, aanwezig in QSS – 1.2
T3b1, aanwezig in QSS – 1.2
T3b2, aanwezig in QSS – 1.2

---

4. Wat zijn de *twee belangrijkste* verschillen tussen opvallende FBMs en opvallende persoonlijke ervaringen (first-hand experiences)? (2 punten)

- **A1. Concept.** FHEs hebben meer invloed (consequentiality / personal importance) en beschermende functies → *1 punt*
- **A2. Voorbeeld:** day to day] life impact en promotes current well-being → *0,5 punt*

- **B)** Bij FHEs is er een thematische samenhang tussen omstandigheid en gebeurtenis → 1 punt
- **C)** en daardoor wordt over FHEs wordt vaker en intenser gesproken en nagedacht dan over FBMs. → 0,5 punten
- **D)** FHEs worden beter onthouden en er worden minder fouten gemaakt. →*0,5 punten*

Voorbeelden

- **A1. Concept.** FHEs hebben meer invloed (consequentiality / personal importance) en beschermende functies → *1 punt*
  => P: pers. ervaringen hebben invloed op je toekomst en FBM veel minder. (#17)
  => T:
- **A2. Voorbeeld:** day to day] life impact en promotes current well-being → *0,5 punt*
  => P: Ast der vom Baum fällt. (#1)
  => T: persoonlijke ervaringen zorgen voor meer "survival" (#14)

- **B)** Bij FHEs is er een thematische samenhang tussen omstandigheid en gebeurtenis → 1 punt
- **C)** en daardoor wordt over FHEs wordt vaker en intenser gesproken en nagedacht dan over FBMs. → 0,5 punten
  => P:
  => T:
- **D)** FHEs worden beter onthouden en er worden minder fouten gemaakt. →*0,5 punten*
  => P: bij opvallende FMBs worden plaats etc. minder goed onthouden dan bij first hand experiences. (#15)
  => T: FHE werden öfter innerlich wiederholt, was das *Erinnerungsvermögen verstärkt*. (#2)
  => **T:** größere Konsistenz bei FHEs; bleiben mehr im Detail gespeichert. (#4)

Items: T4a1 T4a2 T4b T4c T4d
T4a1, T4b1 aanwezig in SA – results
T4a1, aanwezig in QSS – 3.12
T4b, aanwezig in QSS – 3.13
T4c, aanwezig in QSS – 4.14
T4d, (deels) aanwezig in QSS – 4.14

---

5. Hoe wordt het mechanisme dat leidt tot een FBM ook wel genoemd? (1 punt)

- **A)** 'Now Print' → *1 punt*
  OF
- **B)** 'take a picture'→*1 punt*

Voorbeelden

- **A)** 'Now Print' → *1 punt*

=> **P:**
=> **T:** print now (#16)

- **B)** or 'take a picture'→*1 punt*
  => **P:**
  => **T:**

Items: T5a, T5b

---

6. Waarom is de validiteit problematisch bij globale vergelijkingen tussen FBMs en opvallende persoonlijke ervaringen (first-hand experiences)? (4 punten)

Methodologische argumenten
- **A1. Concept:** indices van kwaliteit zijn zwak/variabel → *1 punt*
- **A2. Voorbeeld** van A1: consistency, elaboration, persistence, scales, time delay → *0.5 punt*
- **B1. Concept:** Predictoren zijn variabel tussen studies (emotion, surprise, consequentiality, rehearsal) →*1 punt*
- **B2. Voorbeeld:** varieteit emotion, surprise, consequentiality → *0.5 punt*

Inhoudelijke argumenten
- **C1. Concept**. FHEs vormen een zeer uiteenlopende set van gebeurtenissen - Memories of FHEs make up an extremly broad and diverse analytical category. →*1 punt*
- **C2. Voorbeeld**. ….. →*0,5 punt*
- **D1. Concept**. FBMs varieren sterk in hun invloed. – FBMs vary widely in their influence, events not equally newsworthy or life altering. →*1 punt*
- **D2. Voorbeeld**. .... →*0,5 punt*

Voorbeelden
Methodologische argumenten
- **A1. Concept:** indices van kwaliteit zijn zwak/variabel → *1 punt*
  => **P:**
  => **T:** Er waren verschillende indicatoren en tests gebruikt. Deze gegevens zijn niet altijd vergelijkbaar of makkelijk om te zetten.(#18)
- **A2. Voorbeeld** van A1: consistency, elaboration, persistence, scales, time delay → *0.5 punt*
  => **P:**
  => **T:**
- **B1. Concept:** Predictoren zijn variabel tussen studies →*1 punt*
  => **P:**
  => **T:**

- **B2. Voorbeeld van B2:** varieteit emotion, surprise, consequentiality → *0.5 punt*
  => **P:**
  => **T:**

Inhoudelijke argumenten
- **C1. Concept**. FHEs vormen een zeer uiteenlopende set van gebeurtenissen - Memories of FHEs make up an extremly broad and diverse analytical category. →*1 punt*
  => **P:** omdat persoonlijke ervaringen een breed spectrum beslaan zit hier veel variatie in en dit maakt het moeilijk deze te vergelijken. (#16)
  => **T:**

- **C2. Voorbeel van C1.** →*0,5 punt*
  => **P:**
  => **T:**

- **D1. Concept**. FBMs varieren sterk in hun invloed. – FBMs vary widely in their influence, events not equally newsworthy or life altering. →*1 punt*
  => **P:** unterschied in persoenlicher Relevanz bzw. Auswirkung fuer eigenes Leben. (#22)
  => **T:**

- **D2. Voorbeeld van D1.** →*0,5 punt*
  => **P:** Omdat FBMs niet met elkaar te vergelijken zijn, dat president Kennedy werd neergeschoten is in Amerika heel belangrijk, in andere langen minder. Dat Pim Fortuijn in Nederland werd neergeschoten is in Amerika weer minder belangrijk.
  =>**T:**

Items: T6a1 T6a2 T6b1 T6b2 T6c1 T6c2 T6d1 T6d2
T6a1, T6a2, T6b1, T6b2 aanwezig in SA – results
T6c1, aanwezig in QSS – 5.19
T6d1, aanwezig in QSS – 5.20
T6a1 (indices) en T6b1 (predictoren) worden wel genoemd in QSS 5.17 en 5.18, maar niet gerelateerd aand problematicshe validiteit
T6a1, T6a2, aanwezig in QSS – 6.21
T6b1, T6b2, aanwezig in QSS – 6.22

---

7. Welk voorbeeld wordt genoemd bij studies naar de consistentie van FBMs? (1 punt)

- **A)** De ramp met het ruimteveer de Challenger → *1 punt*
  OF
- **B)** 11 September → *1 punt*

Voorbeelden
- **A)** De ramp met het ruimteveer de Challenger → *1 punt*
  => **P:**
  => **T:** Space-shuttle Absturz (#13)

- **B)** 11 September → *1 punt*
  => **P:** Aanslag op World Trade Center (#14)
  => **T:**

Items: T7a, T7b
T7a, aanwezig in QSS – 6.21

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8. Naar welke concrete zaken vraagt men gewoonlijk als men het heeft over 'omstandigheden' (2 punten)
- **A)** location → *0,4 punten*
- **B**) activity → *0,4 punten*
- **C)** others present → *0,4 punten*
- **D)** time of occurrence / day → *0,4 punten*
- **E)** informant → *0,4 punten*

- **F)** reaction → *0,2 punten*
- **G)** source → *0,2 punten*
- **H)** type of event → *0,2 punten*
- **I)** clothes worn → *0,2 punten*
- **J)** first thoughts → *0,2 punten*

Voorbeelden
- **A)** location → *0,4 punten*
  => **P:** plaats (#14)
  => **T:**
- **B**) activity → *0,4 punten*
  => **P:** wat je deed (#15)
  => **T:**
- **C)** others present → *0,4 punten*
  => **P:** met wie je was (#15)
  => **T:**

- **D)** time of occurrence / day → *0,4 punten*
  => **P:** tijd (#14)
  => **T:**
- **E)** informant → *0,4 punten*
  => **P:**
  => **T:** van wie gehoord (#20)

- **F)** reaction → *0,2 punten*
  => **P:**
  => **T:**
- **G)** source → *0,2 punten*
  => **P:**
  => **T:**
- **H)** type of event → *0,2 punten*
  => **P:**
  => **T:**
- **I)** clothes worn → *0,2 punten*
  =>**P:**
  => **T:** wat had je aan (#20)
- **J)** first thoughts → *0,2 punten*
  => **P:**
  =>**T:**

Items: T8a t/m T8j
T8f, aanwezig in QSS – 6.22

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9. Rubin en Kozin vroegen studenten hun drie helderste (clearest) herinneringen aan te geven. Deze werden opgedeeld in twee soorten herinneringen. Welke van de twee soorten leidde het vaakst tot de helderste herinneringen? (1 punt)

- **A.** First-hand experiences → *1 punt*
- **B.** Persoonlijke gebeurtenissen → *1 punt*

Voorbeelden
- **A.** First-hand experiences → *1 punt*
  => **P:**
  =>**T:** Gebeurtenissen die ze zelf hadden meegemaakt.

- **B.** Persoonlijke gebeurtenissen → *1 punt*
  => **P:** personal FBM (#1)
  =>**T:**

Items: T9a, T9b
De naam van beide onderzoekers wordt genoemd in QSS 7.25, maar de tekst gaat niet in op de vraag, wel een antwoord, maar dan vanuit een andere studie, staat in QSS 8.27

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10. Welke functies helpen bij het herinneren van een gebeurtenis? (2 punten)
- **A1) Concept.** Directive/protective functions → *1 punt*
- **A2) Voorbeeld**. Type of participation. Think about and talk about memories – rehearsal, recalling, retention → *0,5 punten*
- **B1) Concept.** Social and self functions → *1 punt*
- **B2) Voorbeeld**. Rehearssal, To be directly affected or have friends or relatives in the affected area, nearness to real danger , emotionale betrokkenheid→ *0,5 punten*

Voorbeelden
- **A1) Concept.** Directive/protective functions → *1 punt*

=> **P:**
=> **T:**

- **A2) Voorbeeld**. Think about and talk about memories – rehearsal, recalling, retention → *0,5 punten*
  => **P:**
  => **T:**

- **B1) Concept.** Social and self functions → *1 punt*
  => **P:**
  => **T:**
- **B2) Voorbeeld**. To be directly affected or have friends or relatives in the affected area, nearness to real danger , emotionale betrokkenheid→ *0,5 punten*
  => **P:**
  => **T:** Wenn man dem Erlebnis besondere Aufmerksamkeit schenkt. Ausserdem sind *Emotionen* stark mit einem Erlebnis verbunden. (#4)

Items: T10a1 T10a2 T10b1 T10b2
T10a2, T10b2 aanwezig in SA – results
T10a1, T10b1, T10b2 aanwezig in QSS – 8.28
T10a2, aanwezig in QSS – 8.29

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11. Noem twee redenen waardoor mensen zich soms onopvallende persoonlijke ervaring net zo goed kunnen herinneren als opvallende FBMs. (2 punten)

- **A)** Door reconstructie van die herhaald voorkomende gebeurtenissen→ *1 punt*
- **B)** Door de vragen werd de gebeurtenis opvallend gemaakt (research design caused subjects to focus special attention on the everyday event)→*1 punt*

Voorbeelden

- **A)** Door reconstructie van die herhaald voorkomende gebeurtenissen→ *1 punt*
  => **P:**
  => **T:** Routine (#3)

- **B)** Door de vragen werd de gebeurtenis opvallend gemaakt (research design caused subjects to focus special attention on the everyday event)→*1 punt*
  => **P:**
  => **T:**

Items: T11a, T11b
T11b aanwezig in QSS – 8.29, 9. 31 en 9.32

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12. Welke 'maatregelen' kunnen verhinderen dat persoonlijke gebeurtenissen snel vergeten worden? (3 punten)

- **A)** (Elaborative) rehearsal – herhaling → *1 punt*
- **B)** Een verzoek om de gebeurtenissen te onthouden – request to remember (Having the instructions [or intentions] to remember the event) →*1 punt*
- **C)** special cuing - speciale aanwijzingen/specifieke vragen
  ⇨ Students were told they should do their best to remember all the circumstances surrounding that event. →*1 punt*

Voorbeelden

- **A)** (Elaborative) rehearsal – herhaling → *1 punt*
  => **P:**
  => **T:**

- **B)** Een verzoek om de gebeurtenissen te onthouden – request to remember (Having the instructions [or intentions] to remember the event) →*1 punt*
  => **P:**
  => **T:** *Intention wecken*, auch auf alltägliche Dinge zu achten. (#1)

- **C)** special cuing - speciale aanwijzingen/specifieke vragen
  - ⇨ Students were told they should do their best to remember all the circumstances surrounding that event.
    →*1 punt*
  - => **P:**
  - => **T:**

Items: T12a, T12b, T12c
T12a, T12b, T12c, aanwezig in QSS – 9.31