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News in online and print newspapers: differences in reader consumption and recall

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Abstract

How readers consume and recall news presented in online and print versions of two newspapers in the Netherlands are investigated in this experimental study. Few differences are found between the online and print versions in terms of news supply. Reader attention to the news stories varies, depending on the newspaper and news category. No consistent reading pattern is evident and the print version readers do not read more than the online version readers. News Consumption seems to be more dependent on the news category, reader gender and interest in a particular topic than on whether the news appears in print or online. Finally, on the basis of cued and free recall questions, no consistent pattern differentiates readers of the print newspapers from the online versions. In conclusion, evidence has not been found that online readers consume and retain news differently from readers of the print versions examined in this study.

Key words

experiment • news consumption • news recall • online and print newspapers

INTRODUCTION

After a number of years characterized by rapid introduction and development, it now seems safe to conclude that newspapers delivered via the internet have become an established feature of media landscapes in many countries. Still, these newspapers differ substantially with regard to the features and services provided (Jankowski and Van Selm, 2000). Perhaps the greatest uncertainty at the moment is the place that online newspapers occupy in the media behaviors of audiences. More specifically, little is known about differences in consumption and recall of news that is presented through online newspapers in comparison to news that is made available through print versions. In one of the few studies attending to this aspect, Tewksbury and Althaus (2000) report that the readers of online newspapers are unable to understand, recall and situate news items as readily as readers of print newspapers. They suggest that these findings may signal the further decline of collectively-shared information that is considered essential for public discourse and, ultimately, for citizen participation in a democratic state.

The study presented in this article is inspired by the Tewksbury and Althaus (2000) experiment with online and print newspapers. The online and print versions of two newspapers in the Netherlands are investigated: the national paper *de Telegraaf* and the regional paper, *de Gelderlander*. Three questions are posed.

- (1) To what extent are there differences in the number of news stories published in the online and print versions of *de Telegraaf* and *de Gelderlander*?
- (2) To what extent are differences evident in the reading behaviour, i.e. the time, the extent to which, and the order in which readers attend to front page, national, foreign, sport, business and regional news in the online and print versions of *de Telegraaf* and *de Gelderlander*?
- (3) To what extent are differences evident in the ability of readers to recall news items in the online and print versions of *de Telegraaf* and *de Gelderlander*?

PREVIOUS RESEARCH

As noted above, the study by Tewksbury and Althaus (2000) considers differences in knowledge acquisition among readers of print and online versions of a national newspaper in the United States. They state that there

are differences in the manner in which print and online newspapers present the news. In the online version, for example, the number of articles is greater than in the print version, partly due to the fact that the online version does not have the same space limitations. They go on to state that it is possible for readers of online newspapers to consult a variety of related items through the hyperlink structure present in online texts. Generally, print-version newspaper readers must be content with a small number of stories devoted to any one event. And the format of an online newspaper, which presents stories in a more or less parallel structure, provides more control for readers to determine which stories are read and in what order.

These differences can influence the manner in which readers gain information. Tewksbury and Althaus provide evidence that readers of an online newspaper read front page stories less rapidly than readers of the print version of the same newspaper. Moreover, readers of the print version tend to remember story topics regarding national and political news more than online readers. They also recall more news events when probed and can recollect more details of stories than readers of the online version.

In an earlier study Reinking (1988) investigated differences in reader understanding of electronically-distributed texts via a computer screen and on paper. One of the findings reported is that readers of texts made available via a computer screen devote more time to reading these texts when more background information can be accessed than readers of printed texts. Reinking found no evidence of difference in readers' personal assessments of both the electronically-delivered and print texts regarding what was learned. A recent study on information retrieval via the internet (Eveland and Dunwoody, 2000) reports that users spend much effort orienting themselves to the content and structure of the web, at the expense of time evaluating what is eventually found. In other words, the assumption that information retrieval will proceed more efficiently and effectively, and lead to an increase in information and knowledge, is seriously disputed.

Although there are no research findings regarding information transfer for online newspapers, many studies of television news suggest that very little information can be recalled from news programmes. In general, this research documents substantial problems among viewers in separating news items and misinterpreting important details in news stories (Gunter et al., 1982; Katz et al., 1977; Neuman, 1976). These findings may be relevant to differences in news retention among readers of online and print versions of newspapers.

On the basis of the above literature and discussion, the following hypotheses were formulated for this study:

Hypotheses regarding news provision:

H1: The number of news items in the online version of a newspaper is greater than in the print version.

H2: The online newspaper contains more news items in the national, foreign, sport, business and regional news categories than the print version of the same newspaper.

Hypotheses regarding readers' news consumption:

H3: Reading behaviour is different when reading the print version of a newspaper as compared to reading the online version of the same newspaper.

H4: Readers of the print version of a newspaper spend more time attending to news items on the front page than readers of the online version of the same newspaper.

H5: Readers of the print version of a newspaper are able to recall more news events than readers of the online version of the same newspaper.

RESEARCH DESIGN

Newspapers investigated

Two Dutch newspapers were selected for this study: the national newspaper *de Telegraaf* and the regional newspaper *de Gelderlander*. Both newspapers have online versions with comparatively the same amount of news as their respective print versions. Many online newspapers in the Netherlands provide a variety of services but with relatively little news, and such newspapers were considered unsuitable for this study.

De Telegraaf has the largest circulation of all daily newspapers in the country and is read by more than 750,000 people (Bakker and Scholten, 1999). It has the appearance of a popular newspaper, with large headlines, many colour photographs, and a style suggesting identification with the 'common man'. Politically, *de Telegraaf* reflects a centrist stance and is generally supportive of the monarchy. The online version (www.telegraaf.nl) has a 'busy' appearance, using much colour, banners and advertisements. Leaders announce stories found elsewhere in the edition that can be accessed with hyperlinks. A large number of services and sections are available: archives, specialized advertising sections, horoscope and puzzle pages, news sections and breaking news stories.

The print version of the regional newspaper *de Gelderlander* also makes frequent use of colour photographs on the front page, but the overall appearance of this newspaper is more formal than *de Telegraaf*. It is the main newspaper in the province of Gelderland and has a daily circulation of 175,000. The paper generally supports the policies of the Christian Democrat Party and can also be considered centrist in its political stance. The online version of *de Gelderlander* (www.gelderlander.nl) is more sober than that of *de Telegraaf*: there are fewer advertising banners and full-motion illustrations. Photographs are only found on the front page and not on other pages or in other sections of the newspaper. A wide variety of services and sections are made available to readers: news sections, discussion groups, an

archive service and various specialized services such as property, commerce and entertainment.

EXPERIMENT

The procedures developed in the Tewksbury and Althaus (2000) experiment regarding reader attention to the online and print versions of the newspapers were adapted for this study.¹ In terms of internal validity, the two groups of students were randomly assigned to either the print or the online version. Both experimental groups were treated identically, except for exposure to the print or online newspaper version. Students were recruited from two universities in the Netherlands to participate in the experiment. At Twente University, 25 male and 50 female students, and at the University of Nijmegen 14 male and 62 female students, were recruited. All participants were students in the social sciences and between 18 and 28 years of age. The homogeneity in attitude for our purposeful sample of students proved useful in that the potentially resulting differences in reading behaviour, news consumption in general and news recall in particular, would not be due to a difference towards, or time spent with, the internet. The average age was 21. Males and females were spread evenly across the experimental conditions. Grade point average for the majority of participants was 'B' and most came from upper middle-class backgrounds. On average, these students spent 18 minutes per day reading a newspaper, a little more than twice the national average of seven minutes devoted to newspaper reading.

There were few outliers: the amount of time spent reading a newspaper and using the internet proved very comparable. In terms of external validity, the question is whether the observed effects could be generalized to other, older population groups, for example. Students proved to be a useful test group since they are to be considered as a natural current, and certainly as a future user group of online newspapers.

The experiment was conducted between 3 and 7 July 2000. Students at Twente University used the online and print versions of *de Telegraaf*; students at the University of Nijmegen read the online and print versions of *de Gelderlander* (see Table 1).

Participants were invited to specially-arranged rooms at the universities to read either the online or print versions for a maximum of 30 minutes daily, Monday to Friday. They were requested to refrain from attending to any

• Table 1 Number of participants in experiment per version of newspaper

NEWSPAPER	LOCATION	PARTICIPANTS
<i>de Gelderlander</i> printed	Nijmegen	38
<i>de Gelderlander</i> online	Nijmegen	38
<i>de Telegraaf</i> printed	Twente	37
<i>de Telegraaf</i> online	Twente	38

other news sources during the course of the week; this stipulation was repeated each day of the experiment. In this manner, through a procedure developed by Iyengar and Kinder (1987), effort was made to restrict news consumption to that provided by the newspaper read during the experiment. During the sessions, participants were requested to try and inform themselves as broadly as possible regarding the news of the day.

We are aware of the differences that can occur while reading online or printed newspaper versions under experimental conditions or in real life. But those differences are due to extrinsic contextual factors such as reading time, interests shown for certain types of news, reasons for reading a newspaper and similar issues. In this study we were not interested in determining the extrinsic factors affecting reader behaviour. Rather, we wanted to assess what medium-related conditions can do to reader behaviour in terms of recall and comprehension of news. In other words, our research aim was to determine whether different exposure conditions lead to different degrees of recall and comprehension.

Hence, readers of the newspaper print versions were instructed to note in the margins of the articles to what point they had read, and to indicate the order in which articles were read. Readers of online newspapers were requested to note on a separate sheet of paper the titles of articles, the order in which stories were read and the amount of time spent reading each story. This different protocol was needed due to the intrinsic differences between the paper and online newspaper version.

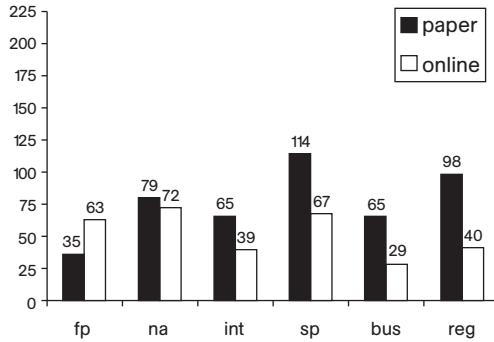
At the end of the first day of the experiment all 151 participants completed a questionnaire regarding media use and basic personal information. This questionnaire also contained a section of 20 items designed to test the participants' general knowledge. At the end of the week a second questionnaire was completed where participants were requested to spontaneously note – free recall – news stories they had read during the week in the national, foreign, sport and economy news categories. Thereafter, participants were asked a number of cued recall questions to test their knowledge of articles appearing in both the online and print versions of the newspapers. These questions were divided across the categories national, foreign, sport and business news.

FINDINGS

News provision

Considering the total number of news stories in the versions of both *de Telegraaf* and *de Gelderlander*, the print versions had substantially more stories than the online versions (see Figures 1 and 2).

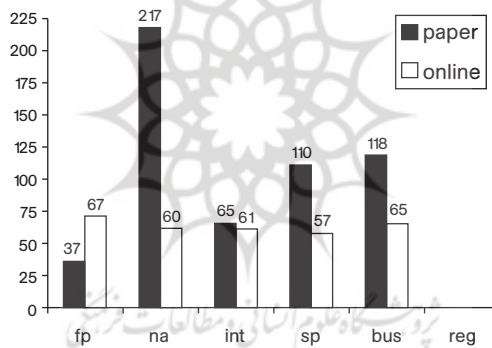
Regarding the number of news stories found on the front pages of these newspapers, considerably more were present in the online versions than the print versions. For the news categories examined (national, international,



Key: fp=front page; na=national; int=international;
sp=sports; bus=business and reg=regional

N online = 310 (40.5%)
N print = 456 (59.5%)
N total = 766 (100%)

• Figure 1 Total number of news stories per section – *de Gelderlander*



See Fig. 1 for Key

N online = 310 (36%)
N print = 547 (64%)
N total = 857 (100%)

• Figure 2 Total number of news stories per section – *de Telegraaf*

sports, business and regional), the amount of news pertaining to national news section was more dominant in the print versions of the newspapers. Expressed as a percentage of the total news supply, *de Gelderlander* online offers more national news than the print version. The same tendency can be observed also in *de Telegraaf* when looking at its international news section. However, in absolute terms the print version offers more news stories than the online version. Percentage-wise, the online supply of international news,

as compared to the total news supply, is larger. When comparing the news supply in the print versions of both newspapers, the most striking difference relates to the national news sections: 79 articles in *de Gelderlander* compared with 217 in *de Telegraaf*. The regional character of *de Gelderlander* explains the central presence of regional news and the more limited attention given to national news. Another difference between the two print versions of the newspapers is the greater attention paid to business news in *de Telegraaf* (118 articles versus 65 in *de Gelderlander*).

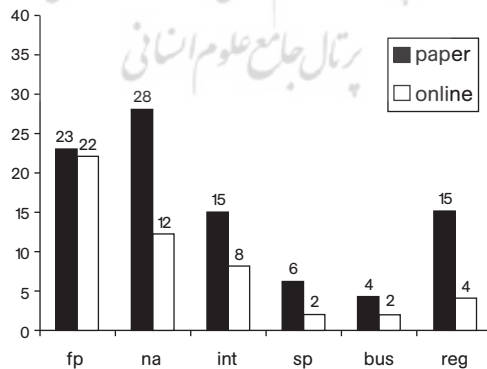
News consumption

This section presents findings from the experiment regarding news consumption: the number of and extent to which stories are read, and the time spent reading them. Also, the order in which news stories are read is examined. Several aspects – medium (paper vs. online), gender, reader interest in particular news and general knowledge – are considered as possible explanatory factors.

Reading patterns: in order to detect potential differences between reading the online and print versions of newspapers, the mean reading time was calculated for all participants in the experiment. Also, effort was made to establish the degree to which news stories were read in their entirety or not at all.

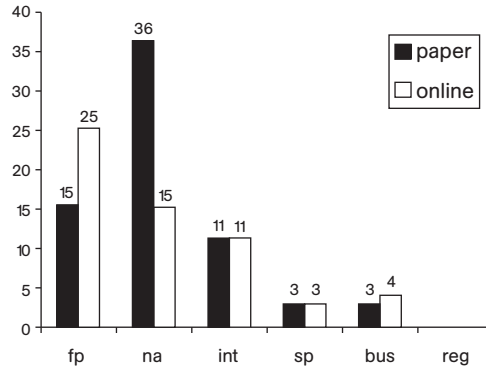
Figures 3 and 4 indicate that although national news in the print version was read the most, it is the front page of *de Telegraaf* online which has the highest readership scores. The larger supply of news stories on the front page of this newspaper, as compared to the paper version, probably explains this.

In *de Gelderlander* online the total number of news stories read, with the exception of the front page, is on average lower than in the print version of



See Fig. 1 for Key

• Figure 3 Mean total news stories read – *de Gelderlander*



See Fig. 1 for Key

• Figure 4 Mean total news stories read – *de Telegraaf*

that newspaper. The main difference in the total number of regional news stories read may be explained by the fact that the print version mainly contains news from Nijmegen, a university town and place of residence for about half of the participants, while the online version contains stories from the whole of the province, with only a small number referring to Nijmegen. Readers of the *de Telegraaf* print version attended to a considerable number of national news stories, which may be explained by the larger number available as compared to *de Gelderlander*. As for the other news sections, on average more stories are read by readers of the *de Gelderlander* paper version. The stories on the front page of *de Telegraaf* online are, on average, read more than the print version. The other news sections show only minor or no differences in terms of the number of articles read.

Amount of time spent per news section

The average time spent reading the front page of the print versions of both newspapers amounts to about five minutes. More time is spent attending to the online versions of the newspapers: the front page of *de Gelderlander* is read in eight minutes on average, and readers of the online version of *de Telegraaf* spend an average of nine minutes. Except for the front page of the print version, more time is spent reading the national, international, sports and business sections in *de Telegraaf*. The online readers of *de Gelderlander* spend on average more time reading the national and international news sections than the readers of the online version of *de Telegraaf*. Online readers of *de Telegraaf* spend in total more time reading the front page and the business news section. It should be noted, however, that in the case of *de Gelderlander*, considerable time is devoted to reading the regional news section.

• Table 2 Regression analysis - mean reading time per news section

	FRONT PAGE β	NATIONAL β	INTER- NATIONAL β	SPORTS β	BUSINESS β	REGIONAL β
Sex	-.137	-.088	-.102	-.290*	-.225*	.133
Newspaper	-.025	.059	-.058	-.014	.193	N/A
Medium (print/ online)	.564***	-.028	.235**	-.149	.142	-.228
General knowledge (moderate/high)	-.058	-.121	-.009	.148	-.171	.129
Interest (small/moderate/ great)	-.080	-.023	.242**	.068	.322**	-.002
Adjusted R ²	.37	-.011	.077	.100	.230	.019

*p < .05; **p < .01; ***p < .001. β : standardized regression coefficient

All in all, readers spend most of their time reading the national news when reading the print version. When expressed in minutes, reading the business section appears to be the least popular among the participating students. In comparing the newspapers on this point, *de Telegraaf* readers spend considerably more time reading the business news section than *de Gelderlander* readers. A comparison between the time spent on the print and online versions of both newspapers shows that much more time is devoted to reading the front page of the online version. In addition, more time is spent reading the international and business news sections. The opposite is the case for the sports and regional news sections, where considerably more time is spent on the print version.

A regression analysis was conducted to determine which of the following potential predictors (gender, newspaper, medium, general knowledge and degree of interest) are of significant influence on the mean reading time per news section (see Table 2).

The variance is relatively well explained by the predictors (adjusted R²; = .325). That readers of online newspapers spend on average more time reading the front page is not surprising since, as mentioned above, the online front page story supply is considerably higher than in the print versions. In terms of reading national news, no significant difference was found. The time that participants spend reading the international news section is related positively to the medium (print versus online) and the extent of interest in foreign news. Not surprisingly, the only positive factor of significant influence on the mean reading time for sports is gender, with women spending less time reading about sports. The mean time spent reading business news is explained mainly by gender and the extent of interest in business news. Male participants and readers with a higher

interest spend more time reading business news than women and readers with less interest in the matter. Also of note, the participants reading *de Telegraaf* tend to spend more time on business news than those reading *de Gelderlander* ($p = .058$). For *de Gelderlander* analysis was conducted to determine whether the above-mentioned predictors had a significant impact on the time that readers spent reading regional news, but this was not the case.

A multivariate analysis on the average time spent on the news sections under study (taking into account interactions between the various predictors) shows that there is an interaction effect between gender and degree of interest. Contrast testing for each news section separately shows that this is predominantly the case when reading the sports news section ($p = .008$). This means that women with a lesser degree of interest are the ones who spend the least time reading the sports section. Also, a tendency towards interaction was evident between the newspaper and medium predictors concerning the time spent reading ($p = .085$), which after contrast testing shows up in the mean reading time spent on the international news section ($p = .012$). This means that *de Telegraaf* readers spend the least time reading the international news section.

Number of news stories read

In order to assess whether there was a difference in the number of news stories read in the print and online versions, a selection of stories appearing in both versions of the newspapers was made. In *de Gelderlander*, 215 corresponding articles were found in both its print and online versions; in *de Telegraaf* 222 were found. In the case of both newspapers more news stories were read in the print versions than in the online versions. In *de Gelderlander* the number of news stories partially read in the print version is more than in the online version. The opposite is the case for *de Telegraaf*: on average only five stories are partially read in the print version, as opposed to 14 online. This means that the number of stories in the print version of *de Telegraaf* that are not read at all or merely partially read is high in comparison with the print version of *de Gelderlander*. *De Telegraaf* seems to encourage a more cursory approach (reading only titles or headlines). Furthermore, effort was made to determine which factor had a significant influence on reading behaviour (see Table 3).

'Whole article' reading behaviour is explained for almost 20 percent by the newspaper and medium variables. The average number of stories read online is lower by six units compared with the print version. In this experiment *de Telegraaf* readers read about eight stories fewer than their counterparts who read *de Gelderlander*. No significant correlations were found between the partial reading of news stories and the medium variable.

• Table 3 Regression analysis – reading behavior for print/online news stories

	WHOLE ARTICLE β	PART β	NOT AT ALL/TITLE ONLY β
Newspaper	-.305***	-.209*	.559***
Medium (print vs. online)	-.331***	-.073	.187**
Adjusted R ²	.193	.037	.340

* $p < .05$; ** $p < .01$; *** $p < .001$ β : standardized regression coefficient

The 'Not at all/title only' behaviour is explained for 34 percent by the newspaper and medium variables. Readers of the print version of *de Telegraaf* and readers of the online versions of both newspapers read less stories than readers of the print version of *de Gelderlander*.

Order in which stories are read

The participants were asked to indicate the order in which they read the news stories. In the case of the print version, participants generally read the front page of both newspapers quite extensively. Afterwards, when selecting articles, they tend to follow the newspaper's structure. Some participants go through the entire newspaper and then return to a particular news story. Stories with larger illustrations and/or headlines, located mostly in the middle of the page, were read first. Then, the page was usually read from the upper left-hand to the bottom right-hand corner.

Online reading behaviour was quite different. Participants mostly began to read the summaries on the front page, clicking on the link when a story caught their attention (then proceeding to read it partially or entirely). The online version features a parallel structure which encourages the reader to go directly to sections of particular interest. Several readers made use of this structure while reading the online versions of both newspapers. Many of the *de Telegraaf* readers first consulted the so-called Newlink, an overview of the most recent news items which is updated several times a day.

Recall of news stories

In order to determine the extent to which the gender, newspaper, medium, general knowledge and degree of interest predictors influence free and cued recall of news stories, regression analyses were conducted. Also, effort was made to determine whether the prominence and the recurrence of certain news frames influence the degree to which news stories are recalled. Through multivariate tests interactions among predictors were assessed.

Free recall: first, the mean number of stories recalled per news section were examined (see Table 4).

News stories pertaining to the national news section are recalled the most in both versions of the newspapers. Participants who read *de Gelderlander*

• Table 4 Mean number of news stories recalled per participant (rounded off)

	DE GELDERLANDER PRINT	DE GELDERLANDER ONLINE	DE TELEGRAAF PRINT	DE TELEGRAAF ONLINE
National*	6	5	4	4
International	4	4	2	4
Sports	3	2	2	3
Business	1	1	1	1
Regional***	3	1	N/A	N/A

*p < .05; **p < .01; ***p < .001

• Table 5 Regression analysis – free recall of news stories

	NATIONAL β	INTERNATIONAL β	SPORTS β	BUSINESS β	REGIONAL β
Sex	.359***	.065	.073	-.079	.092
Newspaper	-.224**	-.098	.011	-.129	N/A
Medium	-.079	.207*	.003	-.090	-.523***
General knowledge	-.006	.112	.082	-.001	-.025
Extent of interest	-.007	.073	.552***	.390***	.068
Adjusted R ²	.188	.041	.287	.162	.275

*p < .05; **p < .01; ***p < .001

(print version or online) recalled more stories from the national news section than those who read *de Telegraaf* ($p = .015$). Readers of *de Gelderlander's* print version recall more stories about regional issues than those who read the online version ($p = .000$).

Table 5 shows that recall of stories can be explained for 29 percent (sports) and 28 percent (regional news) by the above-mentioned predictors.

In these news sections, in comparison with the others, a relative high percentage of variance can be explained by means of the predicting factors. The degree of interest appears to be of significant influence on the recall of sports and business news. Women recall significantly more stories from the national and regional news sections. Also, more national stories are recalled by participants who read *de Gelderlander*. There is a significant difference in recall from the international news sections of the print and online version of both newspapers, with online readers recalling more international news than readers of the print version. Participants who read *de Telegraaf* recall fewer stories from the business section than those who read *de Gelderlander* ($p = .094$). As already mentioned, the supply of international news stories is higher than in the print version. Finally, readers of the print version of *de Gelderlander* recall significantly more stories within the regional news section than those who have read *de Gelderlander* online. A possible explanation for this is that the print version contains more stories from Nijmegen, while the

• Table 6 Regression analysis – cued recall of news stories

	NATIONAL β	INTERNATIONAL β	SPORTS β	BUSINESS β	REGIONAL β
Sex	-.142	.052	.107	.410***	-.118
Newspaper	-.061	-.138	.038	.058	N/A
Medium	.053	.061	.023	-.019	.127
General knowledge	-.041	-.204*	-.208**	-.095	-.335**
Extent of interest	-.028	-.077	-.263**	-.227**	-.178
Adjusted R ²	-.008	.050	.132	.276	.105

*p < .05; **p < .01; ***p < .001

online version also includes news from other, more remote areas of the province.

Multivariate analysis shows an interaction effect on the recall of stories between the newspaper and medium variables ($p = .030$). Contrast testing on the separate news sections shows that this is predominantly the case for international news ($p = .013$) and sports news ($p = .043$). As with time spent on international news, readers of the print version of *de Telegraaf* recall fewer international news stories. Sports stories are the most recalled by readers of the print version of *de Telegraaf*. Also, a tendency towards an interaction effect between the medium and interest predictors seems to exist regarding the business news section ($p = .059$). A tendency was found towards interaction of a higher order between the predictors newspaper, medium and general knowledge ($p = .061$) on the one hand, and gender, newspaper, medium and general knowledge ($p = .072$), on the other. After contrast testing both interactions of a higher order seem to occur most in the business news section ($p = .009$ and $p = .008$ respectively).

Cued recall

The degree to which stories are recalled was calculated by attributing scores from 1 (incorrect) to 4 (completely correct) to content questions asked.

Table 6 suggests a number of remarkable differences.

Surprisingly, and contrary to what can be found in the literature, a more general knowledge does not seem to lead to more accurate recall of stories within the international, sports and regional news sections. In addition, a higher interest in business news does not seem to guarantee the level of accurateness with which stories are recalled. Moreover, women seem to recall business news stories better than men. Moreover, Table 6 shows that a lesser degree of interest in sports is not an impediment for better recall of sports news.

Multivariate analysis conducted on the degree of recall shows an interaction effect between gender and the degree of interest. This interaction effect is found after contrast testing in the business news section ($p = .004$).

• Table 7 Recall of news stories/prominence in combination with newspaper (rounded %)

		NEWSPAPER		
		GELDERLANDER (N = 76)	TELEGRAAF (N = 75)	TOTAL (N = 151)
Low prominence	Incorrect	9	11	10
	Partly correct	82	68	75
	(Almost) correct	9	21	15
Moderate prominence**	Incorrect	38	67	52
	Partly correct	59	33	46
	(Almost) correct	3	–	1
High prominence**	Incorrect	–	12	6
	Partly correct	95	87	91
	(Almost) correct	5	1	3

*p < .05; **p < .01

Recall in terms of news story prominence

In order to assess whether a correlation can be found between the prominence of given stories in the news supply and the degree to which they are recalled, the two items were combined. Participants had to respond to a total of 26 questions distributed across the news sections under study. Of the news stories related to these questions, 12 stories in *de Gelderlander* had high prominence, seven had moderate prominence, and seven had low prominence. In *de Telegraaf*, 22 stories pertained to the issues dealt with in the questions, with 11 having high prominence, seven having moderate prominence and four having low prominence. The combined scores of recall and prominence were assessed per newspaper (see Table 7).

When considering story prominence, almost no differences were found between recall of stories from the print versus the online version. Stories with moderate to high prominence were recalled significantly better by the *de Gelderlander* readers than the *de Telegraaf* readers (see Table 7 above). Regarding moderately prominent stories, participants who had read the print versions of the newspapers tended to recall the stories more accurately ($p = .060$).

CONCLUSIONS

This study was designed to determine whether differences exist in the content of the online and print versions of two newspapers in the Netherlands, *de Telegraaf* and *de Gelderlander*, and to relate any such differences to how readers attend to and recall stories in the print and online versions of these two newspapers. The main findings for the three questions and five hypotheses posed at the beginning of this article are summarized below. Recommendations for further research conclude this section of the article.

News provision

The online versions of both *de Gelderlander* and *de Telegraaf* provide a relatively complete news service covering the diverse categories examined. More news stories appeared in the print versions of the newspapers than in the online versions, but only in the case of national news was there evidence of a substantial difference between the percentage of stories provided in the two versions of the newspapers. Regarding the 'front page' category, the online versions had more stories than the print versions.

The first hypothesis, that online newspapers would have more news stories than print versions, was not substantiated. The second hypothesis – that online newspapers would contain more stories in the national, foreign, sport and business news categories than print versions – was also not substantiated. The evidence presented for these two newspapers suggests instead that both products, online and print, strongly resemble each other in terms of news supply. Of course, this resemblance was also looked for and considered to be a necessary condition when selecting the two newspaper titles; we wanted the potentially different outcomes in reading behaviour and recall to be the result of the newspaper presentation and aimed at excluding as many interfering factors as possible.

News consumption

The number of stories read in the online and print versions of both newspapers were compared for the front page, national, foreign, sport, business and regional news story categories. Readers of *de Gelderlander* online attended to, on average, fewer stories than readers of the print version. The *de Telegraaf* readers reflected a different pattern of news consumption: stories on the front page of the online version were attended to in greater number than in the print version. In contrast, national news in the print edition of *de Telegraaf* was read in a greater amount than in the online version. The other news categories were read essentially in equal amounts for both versions of *de Telegraaf*. Regarding the third hypothesis, then, there is evidence that reader behaviour is different when reading a print or online newspaper version. Moreover, the extent to which stories are read – completely, partially, by title only – varied for both newspapers and for the print and online versions. The number of partially-read stories was greater for the print version of *de Gelderlander* than for the online version. The opposite was the case for *de Telegraaf*. It appears that *de Telegraaf* is used more for summary reading of titles and stories than *de Gelderlander*. When regression analysis was performed it appeared that some 20 percent of the variance attributed to reading stories completely was explained by the variables newspaper and medium. Some 34 percent of the variance attributed to reading only the story titles is attributed to these two variables.

In sum, the *de Telegraaf* readers tended to read fewer articles completely than the *de Gelderlander* readers.

Regarding the fourth hypothesis, the amount of time devoted to stories in the same news categories was examined for both newspapers, print and online versions. Generally, more time was devoted to reading the front page of the online versions of both papers. This can be explained most likely by the tendency that both papers have to place large numbers of articles on this page. Further, the foreign and business news categories commanded more reader time for the online versions than for the print versions; by contrast, sport and regional news were read longer in the print versions of the papers than in the online versions.

With the aid of regression analysis, the influence was measured of several variables on the average amount of time spent reading stories in the above-mentioned categories. Attention to front page news was significantly related to the variable medium (online versus print version); foreign news was related to medium and degree of reader interest; sport news to the newspaper; and business news to reader gender and the degree of reader interest. When possible interaction between the predictive variables was examined, it was found that the combination of newspaper and medium was a determinant for the amount of time that readers attended to several of the news categories. Also, gender and interest in news were determinants for attention to sports news: men with a high level of news interest spent more time on average reading sports news. The above findings suggest a mixed reading pattern which is not at all dominated by the print version. Reader consumption of news seems more dependent on the category of news, reader gender and reader interest in a particular news topic than it is on whether the news appears in the print or online version of a newspaper.

Recalling news stories

The second research question dealt with differences in recalling stories from the two versions of the newspapers. When they were asked to recall freely the stories that they had read during the course of the week, the readers of both newspapers significantly recalled national news more frequently than items from the other news categories. This difference was present for both the online and print versions of the newspapers. Regarding regional news published in *de Gelderlander*, online readers recalled significantly more of these stories than readers of the print version.

In a regression analysis it appears that female readers significantly recalled more national stories than male readers of both newspapers. Online readers tended to recall more foreign stories than readers of the print versions of both newspapers. Readership of sport stories was determined primarily by the gender and version of the newspaper.

When reader recall was cued and compared with measures of general knowledge, it appears that readers with a high degree of general knowledge and those with much interest in business news recall fewer articles than other readers. Women seem to recall business news better than men do. High interest in sports results in a high recall rate of this type of news.

Regarding the fifth hypothesis, then, the results are much too mixed to claim that readers of the print versions are able to recall more news events than readers of the online versions of the newspapers.

Looking at the findings as a whole, no consistent pattern is evident regarding how readers attend to the respective online and print versions of the two newspapers examined in this study. Similarly, recall of news differed between the two newspapers and between the online and print versions, but these differences fail to suggest a clear pattern in ability to recall news. In short, it seems that the manner in which readers consume and recall news provided by online and print newspapers is more complex and varied than is reflected by the foci of this study. Evidence has not been found supporting tendencies suggested in other studies (Tewksbury and Althaus, 2000) that online readers may consume and retain news differently from the readers of print versions of the newspapers. Whether this result is a product of the limitations of this experiment, or whether general apprehension regarding the arrival of online newspapers is unfounded, remains uncertain.

Returning to the Eveland and Dunwoody study (2000), it is conceivable that the lack of increase in information acquisition among participants in the experiment reported in this article may be due to the cognitive investment necessary to gain adequate experience in order to make functional use of online newspapers. Along the same lines, Van Oostendorp and Nimwegen (1998) looked at how people locate information in online newspapers, and paid special attention to the influence of different navigation strategies that were being followed. They concluded that finding information for which scrolling down on a deeper hypertextual level was necessary 'took extra time and probably extra cognitive resources, leading to a lower recognition performance'. According to Sundar et al. (2000), multimedia presentation increased memory for advertising, but decreased it for story content. Further investigations are needed before we can know with any certainty how readers of online newspapers attend to news and what information they retain from such attention. One of the limitations of this study is that it was performed with university students who may have a different disposition to online news sources than other groups of readers. Having stated that qualification, it remains the case that well-educated young people are the most likely future users of online information services.

Another limitation is the present nature of online newspapers, whereby readers must read the news in front of a computer screen. Once technology advances, allowing for lightweight, mobile reading units, it is conceivable

that reading behaviours will also change. And once publishers begin to make greater use of the personalized and multimedia features of internet publishing, it is conceivable that the nature of newspaper 'reading' will change drastically. Still, caution should be taken in making such claims without further empirical basis. To conclude, all of these aspects support the call for continued systematic monitoring of online news services, and particularly of the way in which readers of traditional print newspapers adapt their habits to an internet-delivered news environment.

Complementary, qualitative research is needed in order to investigate the pleasure, or lack thereof, that readers experience while browsing through an online newspaper or reading through a print version.

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Note

1 In addition to this experiment a frame analysis of the two newspapers was conducted, but is not reported here. For details, see Kokhuis and van Summeren (2000).

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