MEDIA COVERAGE OF DIFFERENT SCIENTIFIC DISCIPLINES IN THE CROATIAN DAILY PRESS – SOCIO-HISTORICAL PERSPECTIVE

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ABSTRACT *The goal of this research was to determine the changes in frequency and characteristics of media reporting of different scientific disciplines in the socio-historical context in which they arise. The research was conducted using the method of content analysis, which comprised Croatian daily newspapers with the highest readership in two time periods: 'socialism', from 1986 to 1988, and 'democracy', from 2006 to 2008. The constructed week method was used to select a total of 885 articles. The findings confirm the specificities in media communication of particular scientific disciplines in different socio-political contexts, as well as a tendency of levelling media practices in line with global trends, such as growing orientation towards medicalisation and socio-spatial domination of 'Western' news.*

KEYWORDS

SCIENCE, MEDIA COVERAGE, DAILY PRESS, SOCIO-HISTORICAL CONTEXT, MEDICALISATION

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INTRODUCTION

Analyses of media representation of science are inevitable because the media partially reflect public opinion on the one hand, while they form public opinion on the other (Evans and Priest, 1995). The media act as mediators in co-creating 'scientific culture' and 'scientific literacy', but also as a kind of cultural *indicator* of the public scientific culture within a particular social system (Bauer, 2000), that is, of the position and evaluation of science and scientific disciplines in a society.

However, the media do not engage with all topics (and scientific disciplines) equally. Their selection of events and stories, filters, coverage and interpretation are systematically biased, driven by a combination of public interest, market forces, media norms *etc*. Therefore, there can be great differences in terms of quantity and quality, that is, in the characteristics of media coverage of different scientific topics and fields. Despite the fact that quite a few studies of science in the media partially addressed the media representation of different topics and scientific disciplines, only in a few cases was the research focus primarily on examining, identifying, and analysing the characteristics and specificities of media representations of different scientific (sub)disciplines (*e.g.*, Evans, 1995; Kyvik, 2005; Schmierbach, 2005; Cassidy, 2008; Summ and Volpers, 2016). Unfortunately, comparisons of these studies are often difficult (if possible) because of differences in methodology, analysed time periods, the definition of science news or topics, national and media contexts, *etc*. The current deficit in this kind of research, in Croatia as well as globally, is probably a consequence of individual research interests and traditions, but also of the varying definitions of science and the breadth of this subject.

The aim of this study is to provide a contribution to research efforts in understanding differentiations in media coverage of different science fields, by analysing Croatian dailies and the socio-historical context in which they arise. More precisely, my goal is to determine the frequency and the characteristics of media reporting on different scientific disciplines in two socio-historical periods/contexts: socialism and democracy.

The importance of this study lies in a number of elements. Firstly, the research was carried out in a (post-)transition country, as 'public understanding of science' studies are mostly dominated by analyses in highly developed, English-speaking countries (see Schäfer, 2012). Secondly, the patterns of media reporting and the national/social contexts in which they are formed differ from those characteristic of highly developed countries, which results in certain specificities and cross-cultural differences in the media coverage of particular scientific disciplines (see, Bauer *et al*., 2006). Thirdly, this study's grasp of the socio-historical dimension provides insight into the importance of understanding (changes in) the social context where media patterns and particular scientific interests are formed (see Šuljok, 2015). And finally, it tries to provide a unified overview and insight into the specificities of media reporting on different scientific disciplines.

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MEDIA COVERAGE OF DIFFERENT SCIENTIFIC FIELDS – LITERATURE OVERVIEW

An overview of previous studies indicates that researchers often focused on reporting on the so-called hard sciences, at the expense of soft sciences – social sciences and humanities. Apart from being omitted from the defined object of study, some researchers suggest that social sciences and humanities (SS&H) are also perceived as less scientific, thus being assigned an inferior epistemological and scientific status, both in the media and in the public perception (Dunwoody, 1986; Evans, 1995; Cassidy, 2008). In other words, scholars suggest that content pertaining to SS&H is written about less frequently and in a different way from disciplines that are 'unequivocally' perceived as having scientific methods and findings (*e.g.,* natural sciences), due to the fact that journalists see quantitative research as more precise and more newsworthy (Schmierbach, 2005). Cassidy (2008) notes that social and humanities scientists are not referred to as 'scientists' in media stories, but primarily as 'study authors', which she interprets as resulting from the marginal position of these sciences in the mass media and society at large (*e.g.,* according to the results of the Eurobarometer (2001), EU citizens perceive economics and history as less scientific than, for example, astrology). An additional problem for journalists is the lack of specific sources in social research, especially in comparison with notable sources available for the natural sciences, such as *Nature* and *Science* (Evans, 1995, according to Cassidy, 2008). On the other hand, researchers suggest that social and humanities scientists often take on the role of 'public intellectuals' – commentators or consultants on a particular subject. A Norwegian study (Kyvik, 2005) showed that SS&H scientists were involved in more public visibility and activity – in terms of producing articles and giving interviews – than their counterparts in natural, biomedical, and technical sciences (Cassidy, 2008). On the contrary, Felt (2000, according to Osrecki, 2012) argues that social scientific expertise seems to be less represented in the media when compared to hard sciences. Osrecki (2012) offers an explanation: social scientists tend to 'hide' their professional heritage when addressing a non-academic public. A Croatian study (Brajdić Vuković and Šuljok, 2005) of scientists' commentaries/expert explanations in the daily press, only partially corroborates this thesis seeing that social scientists were the most represented group (41%), followed by biomedical scientists (32%), while scientists in the humanities were represented in only 11% of the total number of cases.

It can be concluded that, when it comes to the intensity of reporting, international research is not unequivocal on the issue of (under)representation of certain scientific disciplines in media reporting, namely of the humanities and social sciences (Cassidy, 2008). On the other hand, many international studies are almost unanimous in finding that biomedical sciences are predominant in contemporary media coverage of science. This phenomenon was noted by a number of international studies (*e.g.,* Pellechia, 1997; Bauer, 1998; van Rooyen, 2002; Bucchi and Mazzolini, 2003; Clark and Illman, 2006, Bauer *et al*., 2006, Elmer *et al*., 2008). Bauer (1998) describes it as *medicalisation of (media) science*, which he interprets by the general medicalisation of society. Friedman (1986) suggests that journalists find it easier and more gratifying to write about findings that have practical

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applications in everyday life (such as medical research), rather than about fundamental science or scientific theories related to fundamental research questions.

Although our focus is not on medicalisation, it is necessary to reflect on its quantitative and qualitative dimensions in order to understand the implications of media reporting on different scientific fields in different time periods. Researchers point out several important dimensions and implications of medicalisation of media reporting. The first dimension refers to the overall domination of biomedical disciplines in science reporting. The second dimension (and implication) refers to the process in which biomedical news is made into the prototype of the public representation of science (Durant *et al*., 1992; Bauer, 1998; Verhoeven, 2008). Finally, Bauer (1998) points out a third important aspect: biomedical sciences become an important factor in the production of science news as reporting on other scientific disciplines grows increasingly similar to biomedical media articles. For instance, personalisation and the use of expert quotations, which were identified by international studies, are spreading from biomedicine into other scientific fields, making the science coverage stylistically less diverse (the homogenization thesis).

How may these differences in the media coverage of scientific fields be interpreted? There are a few plausible explanations for the varying media presence of different science disciplines. Differences in media coverage of particular scientific disciplines can be interpreted by the theories of the public sphere and mass media, that is, by media selection (Schäfer, 2009). News are selected in line with the following social and media criteria: spatial, cultural, and political proximity to the observer; the element of surprise; conflict and controversy; social importance; social and organisational context, market forces, educational background of journalist *etc*. In other words, internal factors in journalism are part of the answer (Badenschier and Wormer, 2012) in which "the news value of science is determined by various factors, least of which the scientific events themselves" (Bauer, 2000: 5). The second interpretation is based on disciplinary differentiations, that is, differences between epistemological cultures that allow for certain scientific disciplines to be 'more autonomous', whereas others are more connected to the social sphere (and to public interests, *e.g*., biomedicine) and more likely to be the subject of public debate (Böschen, 2003; 2004, according to Schäfer, 2009) and sociopolitical influence. Furthermore, Macrakis and Hoffmann (1999) indicate a potentially closer link between soft disciplines and ideology.

Intertwining these approaches means incorporating social and media context as a variable in understanding the media coverage of science. The crucial aspects of understanding the media coverage of science go beyond current and relevant events and findings in the world of science and have to include how they are positioned and evaluated in a particular social context. The study of science coverage in the UK and Bulgarian press (Bauer *et al*., 2006) has already pointed out the specifics of the media coverage of science in different societies that can be partly explainable by differences in social systems and values. For this reason, the media image of science (and scientific disciplines), which is constructed within a specific mutable social, economic, and political context, ought to be understood in that context as already noticed by Gregory and Miller (1998).

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SOCIAL CONTEXT

After the breakup of Yugoslavia, radical changes in the political and economic system have occurred in the nineties: transition from a centrally-planned, government-owned economy to a market economy, the political transition from a non-democratic, single-party system to a multi-party democracy, while the socio-cultural transition comprised wide-ranging social changes in social structure, social values, media changes, *etc*. (Peračković, 2004). The media in Croatia, including the press, have undergone privatization, commercialization and market transition. Peruško (2013) argues that the media system, institutionalized for the first time in accordance with democratic norms and free market, was and continues to be in constant conflict with the remnants of authoritarian elements.

Newspapers of the socialist period were centralized and controlled by the Communist party (Županov, 1995; Jergović, 2004), but mainly through self-censorship according to Peruško (2013). As such, scholars argue that they were not only the source of information, but also a means of propaganda and ideologisation. All socialist societies, including Croatian, harbored the optimistic belief in science and its ability to provide the desired level of economic and technological development (Macrakis and Hoffman, 1999) that was reflected in the media. The media played a significant role in strengthening the 'socialist' ideas and legitimacy. However, according to some authors, the socialist press in Yugoslavia enjoyed greater freedom than the press in other Eastern European communist countries (Jergović, 2004), although a certain degree of isolation was present. The Yugoslav press was to an extent exposed to market forces (*e.g.*, expected to make profit through advertising), but limited the amount of sensationalism in the name of 'social responsibility' (Robinson, 1977). However, the transition did not bring about an increase in the quality of journalism (Jergović, 2004). Today, media content includes more tabloidisation, sensationalist reporting, celebrity coverage, advertising and a decline in journalistic standards/ethics (Popović, 2014; Vilović, 2003). Old journalistic values have been abandoned and newspapers are made up of short texts, sensationalist titles and a lot of photographs (Kanižaj, 2007). Peruško, Vozab and Čuvalo (2013) claim that the Croatian media system falls into the post-socialist cluster, characterized by low professionalization of journalism, low newspaper circulation, low to medium quality of public service television, high political parallelism and a strong role of the state. Today the media are more open and less susceptible to political pressure (than before), but also facing the problem of low professional standards.

Furthermore, during the (post-)transitional period, Croatian society has been occupied with a wide variety of social processes (economy, poverty, war, human rights *etc.*), boosting social and media marginalization of science. In the situation of armed conflicts, non-transparent privatization, corruption, rising unemployment, and general preoccupation with more important social issues, media coverage of science probably would not hit a significant public response. Science sections were already rare in the Croatian socialist press, but during (post)transition have almost completely disappeared from the newspapers. A similar observation was reported by a Russian researcher Egikova (2005). Social and economic collapse of the USSR led to actual disappearance of scientific

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journalism in Russia and media reorientation toward market principles just further strengthened marginalization of scientific topics. Therefore, marginalization of science in Croatia did not start with the transition, yet the transition, war and tabloidisation deepened it.

RESEARCH OBJECTIVES AND QUESTIONS

Examining the disciplinary structure of media reports started from the following research objectives:

>to explore levels of representation (frequency) of scientific disciplines in the Croatian daily press,

>to examine qualitative characteristics of the media coverage of various disciplines,

>to assess changes between analysed time frames.

Characteristics of media reports were operationalized by using the following variables: the level of representation; the socio-spatial origin; the journalistic form and the relevant *scientific background information* featured in the texts.

In line with theory and the findings of the previous studies, this study aims to answer the following research questions.

Level of representation. Frequency of articles.

By analysing the frequency of articles I want to find out whether different scientific fields receive equal media coverage. More precisely, I will try to answer the following questions: whether social sciences and humanities were more prominent and represented in the socialist press then today? Was medicalisation of science present in the socialist period? What are the prevailing science topics in the (post)transition Croatian daily press (medicalisation)?

Socio-spatial origin. I analysed science articles in terms of territories of origin, *i.e.*, the (dominant) country of science events/topics, which were then grouped according to the level of economic and social development, as well as geographical-historical similarities.

Through socio-spatial data I attempt to answer whether the media focus in socialism was less on science news from Western countries and more on the local (Yugoslav) science news, and whether opening, reorientation toward Western 'international' science news, occurred in (post)transition? Furthermore, it is to be established whether there are differences in socio-spatial origin of science articles from various disciplines.

The journalistic form. This variable can be a useful indicator of the treatment and approach taken when writing about science research topics. The dominance of the news and report forms was established by international studies. A study of team science visibility (Illman and Clark, 2008) found that most media genres were made up of news and reports (76%), whereas the remaining 23% comprised longer forms.

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I want to explore which journalistic form is dominant in both time periods and whether there are differences between scientific fields, particularly in favor of the interview when it comes to social sciences and humanities and the role of 'public intellectuals'.

An index/scale of 'scientific background information'. It was constructed to briefly address how scientific disciplines are treated in media presentations of science, especially in terms of differences between social sciences/humanities, *i.e.*, *soft* and *hard* disciplines. An index/scale was constructed by summing up the results of the following variables: whether the articles stated the relevant research hypotheses; research methods; scientific equipment; locus of research; duration of research; the funding sources of research; and finally, the name and the institution of the researcher(s). The sum-up yielded a scale of 0-8 points[1].

In this study, I want to determine the level of *'scientific background information index*' in both periods. Also, I will try to answer whether the media are treating social sciences and humanities worse than other science disciplines and whether biomedical reporting pattern ('homogenisation') is expanding to all disciplines?

METHODOLOGY

The research was conducted using the content analysis on daily newspapers with the highest readership in Croatia in two time spans: from 1986 to 1988 (*Večernji list*, *Vjesnik*, *Slobodna Dalmacija*), and from 2006 to 2008 (*Večernji list*, *Jutarnji list*, *24sata*). These time spans were specifically targeted because they enabled a comparative analysis of science in the media in two politically, economically, and socio-culturally different contexts: first, shortly before the collapse of the socialist regime while Croatia was still part of Yugoslavia, and twenty years later, in the (post-)transition period as an independent democracy.[2]

Despite the fact that print media have for a long time lagged behind television in quantitative terms of influence (as well as readership), and unquestionable strengthening of new media, they were selected to be used in this analysis, primarily for practical reasons (availability and low cost, as well as the relatively easy option of expanding future analyses by incorporating earlier time periods or other media forms), and also because research findings indicate that print media are still an important source of information about science (Nisbet *et al*., 2002). Further, taking into account the criticism by Evans and Priest (1995) regarding the overrepresentation of elite yet low-readership media in studies, the dailies with the highest readership in the relevant socio-historical periods were sampled. It was impossible, as well as unfounded, to analyse the same newspapers in both time periods. The dailies that have the highest readership today (*e.g., Jutarnji list* and *24sata*) had not yet been founded in the pre-transition period when Croatia was part of socialist

[1] If a particular characteristic was not present, the value assigned was zero.
[2] When choosing time-spans it was assumed that it was important to capture the late socialist (pretransitional) period as a starting point for analyses and comparisons. Although the late socialist period cannot be fully representative of the entire period of socialism (limitations of this study), the selection of these time-spans provides the possibility of a) expanding the study in the future, that is, expanding analyses of media coverage by analysing earlier/later periods and b) grasping major changes in media coverage of science.

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Yugoslavia, whereas the dailies that used to be relevant and well-read (*e.g., Vjesnik*) completely lost their importance (having their readership decline to below one percent), and finaly ceased to exist in 2012[3]. This resulted in different selections of print media in the two time frames. For this reason, it was not possible to compare newspapers individually between the two periods (with the exception of *Večernji list*). All of the highest-readership dailies from a given period were therefore considered as a (composite) sample for that specific period (regardless of the levels of representation of tabloids, semi-tabloids, or the elite press). Readership data for the 2006-2008 time period was provided by *Ipsos Puls*, an independent market and public opinion research agency, whereas data for the 1986-1988 period were based on the estimates of readership levels and publication data as the only available sources of information in the selection of newspapers.

Since analysing every newspaper individually would topically deflect this research from its main goal (establishing the disciplinary differences), this paper will not focus on that.

Sampling. The sampling was carried out using the 'constructed week' method, for reasons of efficiency, as well as the cyclic variations of content during the week (Riffe *et al*,. 1993; Lacy *et al*., 1995). This is the only method that ensures equal representation of all days of the week, which is necessary because of the tendency (as noted by Bader, 1990; Bucchi and Mazzolini, 2003) to feature scientific news in weekly, not daily, newspaper sections. Therefore, three weeks[4] were constructed to represent each year, resulting in a total sample of 378 issues out of the total newspaper population[5], or 189 issues for each time period analysed.

The basic unit of analysis was the science article, which was identified according to Bauer *et al.* (2006) as any article that referred to a science research activity, project, topic, or to science in general (*hard sciences,* such as biology or physics, as well as *soft sciences* – social sciences, such as psychology, sociology *etc*., and the humanities[6]). Topics that addressed technology were excluded from this analysis unless they were presented as part of the science research process[7].

[3] *Vjesnik*, a quality paper, had a wide readership which was later drastically lost. The newspaper was closed down in 2012. *Slobodna Dalmacija,* a popular regional newspaper, was one of the most widely read dailies in former Yugoslavia (especially in the 1980s), but readership has declined. *Večernji list*, a halftabloid, has undergone privatization and is today officially owned by *Styria Medien AG*, although there is speculation that a right-wing politician might be behind the newspaper. It is considered a conservative newspaper. *Jutarnji list*, a half tabloid, launched in 1998, was owned by *Europapress Holding & WAZ-Mediengruppe* in the 2000s. Now *Jutarnji list* is under Croatian ownership, *Hanza Media*. It leans more toward social democrats. *24sata*, a tabloid, was launched in 2005 and is owned by *Styria Medien AG*. It is characterized by a wide circle of readers and short news.

[4] According to Stempel, 12 (*i.e.*, 14) days or a constructed two-week sample is sufficiently representative of the entire year (1952, in Riffe *et al*., 1993: 135). Moreover, other researchers argue that one constructed week would suffice, but that two or more constructed weeks would improve accuracy, especially in studies that cover periods longer than six months (Riffe *et al.*, 1993: 138).

5 The sampling was carried out using the Random Calendar Date Generator programme (*random.org;* by dr Mads Haahr, Trinity College, Dublin).

[6] I tried to place every article in the context of the scientific discipline to which it pertained. In cases where articles covered interdisciplinary subjects, I tried to identify the dominant perspective/discipline. I used the official document regulating the classification of sciences in the Republic of Croatia (*Pravilnik o utvrđivanju znanstvenih područja*, NN 029/1997). If an article covered science-policy issues – such as national awards for scientific research, sessions of parties or government bodies and the like – it was labelled as 'Other'.

[7] Readers' comments and questions were also excluded, as were published denials and similar pieces.

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There were two steps in selecting the articles to be analysed. A primary selection was carried out using key words (in Croatian): *science*, *scientist(s)*, *scientific* (and other variations on the term 'science'), *research*, *researchers* (and other variations), *finding*, and *study*. The second step involved a detailed examination of selected articles individually to exclude those which did not refer to science (for instance, public opinion polls). The primary selection of articles and coding of manifest variables (title, page number, *etc.*) was carried out by the *Presscut* media monitoring agency, as well as by an associate independent coder, whose work was supervised by the author[8]. Further coding was carried out by the author, with subsequent verification (after 12 months) of intracoder reliability using a subsample (5%) of articles[9]. Articles were selected using *Presscut* archives and library newspaper collections. My selection and analysis incorporated a total of 885 articles. The data provided by the content analysis was processed in SPSS.

FINDINGS

Levels of representation and media standing of scientific disciplines. The results presented in Table 1 show significant differences in the levels of representation of different scientific fields in the periods analysed (χ^2=110,032, df=6, sig=0.000).

Table 1. **Overview of representation of the scientific fields by dailies over two distinct time periods**

	1986-1988 N=475				2006-2008 N=410			
	Slobodna Dalmacija	*Večernji list*	*Vjesnik*	**Total %**	*Jutarnji list*	*Večernji list*	*24 sata*	**Total %**
Social Sciences	16.2	13.5	14.1	**14.5**	5.1	12.4	16.4	**12.4**
Humanities	14.0	17.3	19.9	**17.5**	6.3	3.8	2.1	**3.7**
Natural Sciences	18.4	27.1	24.3	**23.4**	31.6	25.4	11.0	**21.5**
Biomedical Sciences	32.4	30.8	23.3	**28.0**	50.6	47.6	68.5	**55.6**
Biotechnical Sciences	2.2	2.3	1.0	**1.7**	1.3	4.3	.7	**2.4**
Technical Sciences	3.7	1.5	4.4	**3.4**	2.5	3.8	.7	**2.4**
Other	13.2	7.5	13.1	**11.6**	2.5	2.7	.7	**2.0**

The greatest differences between expected and observed values were found in three areas – biomedical sciences, humanities, and the 'Other' category, which mostly comprised news articles related to science-policy events. In the socialist period, the highest level of representation was noted in biomedical sciences. The absolute dominance of biomedical sciences becomes even more profound in today's media: this is especially the case with the tabloid *24sata*, where two-thirds of science articles are biomedicine-related, with the proportion of biomedical articles remaining as high as 50% in the other dailies that were

[8] In order to verify the reliability of this selection method, an initial test was carried out using a subsample of articles, with the aim of establishing whether articles that were selected by the author matched the articles selected using this method: the result was a high degree of agreement.
[9] The intracoder reliability coefficient was high for the analyzed variables (> 0.90).

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analysed. Deeper thematic insight shows that, whereas reporting on biomedical sciences in the socialist period used to focus more on illnesses and methods of treatment, *i.e.*, on researching the causes of illnesses and drug development, today they focus on prevention and health preservation/prevention-related research.

The overall level of representation of natural sciences in dailies is slightly smaller in comparison with the earlier period, but they remain second to biomedical sciences. The proportion of news articles that refer to natural sciences was considerably smaller in *24sata* when compared to the other dailies. It can be presumed that this is a reflection of the tabloid character of this particular newspaper, and that natural sciences are probably considered too 'complex' and are avoided in favour of biomedical topics and articles with content, such as "researchers find that green tea fortifies your bones", which easily deliver (misleading) messages while offering no accompanying elaboration. Overall, with regard to natural sciences, the (post-)transition period (2006-2008) is dominated by topics in (molecular) biology (12.8%)[10] and, to a lesser degree, physics (mostly astronomy) (6.1%), whereas the socialist period was dominated by articles that covered physics and space exploration (15.9%), biology (especially ecology) (5.1%) and geosciences (3.8%).[11]

Another significant difference that emerged was the proportion of humanities-related articles: they were virtually eliminated in the (post-)transition period. The (extremely) low number of remaining humanities-related articles mostly covered the subjects of anthropology/ethnology (2%), whereas archaeology[12] and history had dominated the earlier period with 5.8% and 5.5%, respectively.

The levels of representation of social, biotechnical, and technical sciences remain mostly unchanged. Social sciences account for a fairly considerable share in the total number of science articles (about one-seventh, with the exception of *Jutarnji list*). However, there was a shift towards topics in the field of psychology (10.1%), *i.e.*, popular psychology, accompanied by the marginalisation of other social disciplines, whereas sociology, political science and psychology used to have similar proportions in the total number of articles (3-4% each).

Biotechnical and technical disciplines were and remain marginalised in terms of media coverage. The reason for this was partially our selection method, which excluded technology as a topic unless the article explicitly referred to scientific research. The predominant topics in today's daily press are food technology (2.5%) and electrical engineering (1.8%), whereas science articles in the earlier period were dominated by agriculture sciences (1.7%) and 'a bit of everything' in the area of technical sciences (shipbuilding, transportation science, and other disciplines).

[10] Expressed as a proportion of the total number of articles covering all scientific disciplines.
[11] Due to the limited scope of this text, the data that were collected on the levels of representation of all scientific disciplines will not be presented, but only those with the highest frequency (more than 50 scientific subdisciplines were identified).
[12] The definition of 'science articles' included those where actors of science were identified, *i.e.*, articles where the findings were interpreted using scientific references, previous studies, *etc.* Archaeology-related articles that did not contain scientific elements were excluded from this analysis. The decline in the number of archaeology-themed articles which were identified in today's media was brought about by the change in the way this topic is presented: the cultural aspect of archaeological research is prevalent today.

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Finally, a decline was noted in the level of representation of the 'Other' category, which we used as a label for articles that mainly covered science policy content in the dailies analysed.

Socio-spatial origin. As Table 2 indicates, different scientific disciplines varied in terms of socio-spatial origin in both time periods analysed, but differences were also noticed within a single scientific discipline over two periods of time.

Table 2. **Overview of the scientific fields by socio-spatial origin and time period**

	Social Sciences and Humanities		Natural Sciences		Biomedical Sciences		(Bio)Technical Sciences	
	1986-1988	2006-2008	1986-1988	2006-2008	1986-1988	2006-2008	1986-1988	2006-2008
Croatia	47.3%	26.8%	14.7%	20.0%	12.2%	16.1%	54.5%	36.4%
USA	6.8%	30.4%	30.5%	30.0%	39.1%	44.0%	13.6%	27.3%
Europe – developed countries	8.9%	30.4%	23.2%	28.6%	21.7%	25.6%	9.1%	36.4%
World – developed countries	2.1%	5.4%	8.4%	10.0%	8.7%	11.3%	0%	0%
World – developing countries	3.4%	3.6%	1.1%	5.7%	4.3%	1.8%	0%	0%
Ex-Yugoslavia countries	27.4%	1.8%	5.3%	2.9%	8.7%	.6%	22.7%	0%
Europe – Eastern European countries	4.1%	1.8%	16.8%	2.9%	5.2%	.6%	0%	0%

Both time periods, especially socialism, saw a slightly higher share of 'national' news related to the softer disciplines (social sciences and humanities), as well as (bio)technical sciences, compared to natural and biomedical sciences. A comparison between the two periods indicates that the greatest differences occurred in the geographical context of articles that covered social sciences and humanities, and (bio)technical sciences (Table 2)[13]. As Table 2 shows, in the earlier period over three-quarters of articles related to social sciences and humanities originated within the national context of Croatia and Yugoslavia. Today there is a different tendency, which is to import news mostly (60.8%) from Western countries (Europe and the United States).

More precisely, socialist-period articles related to social sciences or humanities mostly presented new (domestic) scientific publications, or served to inform the readership about scientific (or scientific-political) events, which often focused on prominent figures of socialist (Marxist) thought and/or movement (Karl Marx, Svetozar Marković, Josip Broz Tito). Today, articles that cover social sciences and humanities are dominated by popular

[13] It was not possible to carry out a statistical analysis after using crosstabs between individual categories because it yielded a lower or nonexistent N-value, so the research was limited to a solely descriptive analysis. We also classified the scientific fields into related groups for the same reason.

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psychology and related topics, which mostly originate from (research studies and findings in) developed European countries and the United States.

When it comes to news from biomedical, and especially natural sciences, the differences in geographical orientation between the two socio-historical periods are far less striking. Merely one-fifth of articles in the field of natural and biomedical sciences used to originate from within the country. Today, as well as in the earlier period, they mostly come from developed Western countries.

(Bio)technical news in the socialist period mostly originated within the country (three-quarters), whereas today there is a larger share of news coming from the United States and Europe. However, due to the extremely low number of these articles, any further generalisation on this subject would be difficult.

Journalistic form. We used a chi-square test to test the relationship between the two variables: the journalistic form and the time period ($\chi 2=30.258$, df=6, sig.=0.000). In the pre-transition period, the following forms exceeded expectations in terms of levels of representation: interviews, commentaries, and especially portraits. The later period saw more news and reports, and fewer commentaries and portraits. In the socialist period, two-thirds of all scientific articles (66.5%) were written in the *news* form, with reports in the second place (14%) (Table 3). Table 3 indicates an overall dominance of the *news* form in media coverage of science, especially in biomedical sciences.

Table 3. **Overview of the scientific fields by the journalistic form over two distinct time periods**

	Scientific field							**Total**
	S. S.	H.	N. S.	BM. S.	BT. S.	T. S.	Other	
News 1986-1988	65.2%	59.0%	69.4%	81.2%	75.0%	56.2%	40.0%	66.5%
2006-2008	51.0%	53.3%	78.4%	72.8%	40.0%	80.0%	87.5%	70.2%
Report 1986-1988	20.3%	14.5%	6.3%	8.3%	0.0%	12.5%	40.0%	14.3%
2006-2008	27.5%	20.0%	19.3%	18.9%	50.0%	10.0%	0.0%	20.2%
Feature 1986-1988	0.0%	7.2%	10.8%	3.8%	12.5%	6.2%	5.5%	5.9%
2006-2008	15.7%	6.7%	0.0%	5.3%	10.0%	10.0%	0.0%	5.6%
Interview 1986-1988	1.4%	6.0%	0.0%	2.3%	0.0%	12.5%	1.8%	2.5%
2006-2008	3.9%	13.3%	0.0%	1.3%	0.0%	0.0%	0.0%	1.7%
Commentary 1986-1988	5.8%	1.2%	5.4%	0.0%	0.0%	0.0%	73%	3.2%
2006-2008	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	12.5%	0.5%
Portrait 1986-1988	4.3%	10.8%	6.3%	1.5%	0.0%	12.5%	1.8%	5.1%
2006-2008	0.0%	6.7%	2.3%	0.0%	0.0%	0.0%	0.0%	0.7%

Note: S. S. - Social Sciences, H. - Humanities, N. S. - Natural Sciences, BM. S. - Biomedical Sciences, BT. S. - Biotechnical Sciences, T. S. - Technical Sciences.

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	Scientific field							Total
	S. S.	H.	N. S.	BM. S.	BT. S.	T. S.	Other	
Other 1986-1988	3.0%	1.3%	1.8%	2.9%	12.5%	0.0%	3.6%	2.4%
2006-2008	2.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	1.0%
Total (N) - 100%	69	83	111	133	8	16	55	475
	51	15	88	228	10	10	8	410

Note: S. S. - Social Sciences, H. - Humanities, N. S. - Natural Sciences, BM. S. - Biomedical Sciences, BT. S. - Biotechnical Sciences, T. S. - Technical Sciences.

The *report* form was slightly more frequent (one-fifth) in articles that covered social sciences compared to the coverage of other disciplines, with the exception of the 'Other' category, which had an above-average representation in the *report* form. This is partly due to the scientific-political saturation of these articles. The *feature* was represented in a modest 6% of the total number of articles. Twenty years later, the *news* form remains dominant (70.2%), while the *report* form is represented in one-fifth of all articles. The *feature*, which is a longer, more complex and comprehensive form, is still represented in slightly less than 6% of all cases. The frequency of the *news* form increases in the category/disciplines that used to be dominated by other journalistic forms ('Other' and 'Technical Sciences'). On the other hand, there has been a shift in favour of slightly longer forms – the *report* and the *feature* – with social, biomedical, and, to a certain extent, biotechnical sciences, as well as in favour of the *interview* in humanities-related topics.

Scientific background information. As Table 4 indicates, the average scientific background information index in media articles from all scientific fields was very low.[14]

Table 4. **Index of scientific background information (SBI) by the scientific field over two distinct time periods**

	Total 1986-1988 (N=189)	Total 2006-2008 (N=318)
Social Sciences and Humanities	1.8	1.6
Natural Sciences	1.7	1.9
Biomedical Sciences	1.3	1.3
(Bio)Technical Sciences	2.4	1
Average index of SBI	**1.6**	**1.4**

[14] The index was calculated using only those articles that announced upcoming research, communicated research results, *etc.* N1=189; N2=318. My criteria in determining whether an article contained methodological and other relevant information were very mild: I included articles that contained incomplete information (*e.g.*, only the number of research participants, incomplete name of institution, and the like). Any more leniency on my part would have resulted in virtually no articles providing relevant background information.

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There were no statistical differences between the two periods analysed (t=1,279, df=505, sig.=0.202). However, the analyses did confirm the existence of differences between scientific disciplines in terms of scientific background information featured in articles during the socialist period: the differences were small but significant (F=3.251, df=188, sig.=0.023)[15]. The lowest average index was registered in the coverage of biomedical sciences; also, post-hoc tests pointed out small but significant differences between the biomedical and the social sciences/humanities, which registered the highest index, along with the biotechnical sciences (Table 4). The most common information provided referred to the names and institutions of researchers: about half of the articles contained this data. On the other hand, research hypotheses and data on methodology, which is common in scientific reporting, were only present in a few of the articles.

When the (post-)transition period is observed, small but significant differences emerge again between the scientific background information featured in articles that cover different disciplines (F=4,696, df=316, sig.=0.003). The biggest differences were observed between articles covering natural sciences, which saw a slight improvement in background information compared to the earlier period, and those covering biomedical and (bio)technical topics, which registered the lowest index.

DISCUSSION

As stated in the literature overview, the media coverage of science and scientific disciplines is inextricably linked to its wider socio-cultural context. The findings of this study will now be examined and discussed through the prism of (transformations in the) social context.

The findings confirm presumptions and observations by international researchers that scientific fields do not receive equal media coverage. In both time periods analysed, but especially in the (post-)transition period, the Croatian daily press mostly reported on biomedical topics, which is interpreted by their link to the public sphere, practical relevance in everyday life, as well as by media criteria and editorial policies.

Medicalisation of science, although present in media and societies abroad, is intensified by several characteristics of the media space in Croatia. Firstly, a great proportion of science news comes from international sources (the Internet; web portals; media agency news), which are often dominated by biomedical topics. Secondly, the Croatian media are generally characterised by the lack of science sections and journalists who specialise in science topics.[16] As Bader has already established (2000), introducing

[15] Due to the low N-value, I grouped the scientific fields into Social Sciences/Humanities; Natural Sciences; Biomedical and (Bio)Technical Sciences.

[16] Specialized newspaper sections dealing with science topics existed in 1986-88 in *Vjesnik (Medicina, Istraživanja, Znanost, Novosti iz medicine, Znanstvena kronika),* and in *Večernji list (Popularna znanost, Novo u medicini).* In 2006-8, none of the analyzed newspapers had regular serious sections devoted exclusively to science topics (although one of the best European science journalist, Tanja Rudež, writes about science in *Jutarnji list*). In 2017, the activity of the *Association of Science Journalists* of the *Croatian Journalists' Association* was resumed.

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science sections expands the repertoire of science-research topics (and disciplines) in newspapers. Thirdly, some researchers suggest that journalists (especially those not specialised in science journalism, which is the case with most journalists in Croatia) find it easier and more gratifying to write about findings that have practical applications (such as medical research), rather than about fundamental science or scientific theories related to fundamental research questions (*e.g.*, Friedman, 1986). If we add the public interests to these findings, it is not surprising that the sphere of the Croatian media is dominated by biomedical content.

On the other hand, this research did note certain specificities and shifts in the levels of representation of particular scientific disciplines over time. The formerly high(er) representation of the humanities (and some of social sciences) could be explained in part by the potentially closer link between these soft disciplines and ideology (Macrakis and Hoffmann, 1999), due to the fact that the knowledge they produce is closely linked with the broader social context. For instance, a comparison between science coverage in the UK and Bulgaria by Bauer *et al.* (2006) concluded that the *medicalisation of science* in the Bulgarian press was not as prominent as in the British press because social sciences and humanities had been important as a scientific ideological basis of the Communist Party, and therefore better represented in the Bulgarian media. Although our findings show that the media in Croatia were not dominated by social sciences and humanities even during socialism, these disciplines were still used for ideological purposes to some extent, if not to directly propagate political agendas, then to demonstrate a 'scientifically' based and (socially, politically, and economically) successful socialist order in Yugoslavia. In other words, although the press in Yugoslavia had more freedom (Županov, 1995; Jergović, 2004), journalists were still accountable to the official ideology and the state/political regime. Tanović suggests (2001) that social sciences and humanities legitimised, 'scientifically' and ideologically, the political system and mainstream practice of socialism. Tanović's claim is a radical, because criticism of and opposition to socialism first emerged among social and human scientist (e.g. Praxis), but our findings (socio-spatial origin and topics; levels of representation of particular scientific disciplines) do corroborate that the ideological impact, as well as their utilisation towards legitimising certain ideas, was more powerful with the social sciences and humanities than the 'hard' fields of natural or biomedical sciences. As ideological political functions fade, these sciences decline in terms of media (and social) importance (interests), which is particularly noticeable in the humanities, but also in political science, sociology, and law. In other words, articles with humanities-related content (but also related to some of the social sciences) were more strictly controlled and less sensitive to events in the world of science, and more connected with the social sphere, namely with political interests and influence, which is another confirmation of the importance of analysing social context in the co-creation of the media image of science.

My findings concerning the socio-spatial origin of articles corroborate the link between ideology and soft sciences. Generally, during socialism, the media focused less on science news from Western countries (although they were by no means insensitive to global developments), and more on the local (domestic) science community and its

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scientific production. Further, smaller current number of articles covering science topics from Eastern Europe (especially Russia, or the former Soviet Union) and the countries that used to be part of former Yugoslavia, suggests that politics had an extensive impact on article selections. With the disappearance of the former general societal and media emphasis on domestic politics and issues that were of consequence for the socialist regime, this reorientation was reflected in modes of science reporting as well, primarily in soft sciences. Although it remains a fact that the topics and findings of social sciences and humanities are often of a more local character, thus making related science media articles more nationally oriented, I ascribe the decline in their coverage (primarily of the humanities, as well as some of the social sciences) in the daily press to their prominent public, social, and sometimes ideological role in the socialist period, *i.e.*, its declining influence over time.

Unlike the field of social sciences and humanities, news related to biomedical and natural disciplines originated, as it does today, primarily in developed Western countries. There are two explanations for this: firstly, these countries have a central role in the production of scientific knowledge (major centres of global science are mostly located in developed Western countries), whereas Croatia (with its existing science infrastructure, investment, and output) existed, and continues to exist, on the margins of world science.[17] Secondly, biomedical and natural sciences have a more universal/international character in terms of content and research subjects, therefore they had more autonomy, less ideological interest, and more protection from ideological influence.

Articles related to (bio)technical sciences were generally underrepresented in the media, in both time frames, which could be related to perceptions of their marginal role in domestic development and innovation. (Bio)technical stories have also seen a significant change in terms of their geographical origin; following the geographical distribution of centres of science, technology, and innovation, they are more oriented towards developed Western countries today. Their leading role in the formerly local orientation should probably be ascribed to their applicability (shipbuilding, transportation science, and other disciplines), as well as to the dominant public discourse of the time, which celebrated national achievements (see also Šuljok, 2015).

The aforementioned patterns of representation and socio-spatial origin of disciplinary news resulted from changes on multiple levels. Firstly, political changes meant opening up and orienting more towards the economically, scientifically, and technologically developed Western countries. Secondly, information and media changes increased the availability of different news sources, and brought about a change in the editorial policies of different media. Finally, a third type of change occurred on the level of social (and media) evaluation, especially of national science and its achievements, that is, society's general attitude towards the value of (national) knowledge and science (including their devaluation).

[17] For instance, Croatia's public expenditure for science and research amounted to 0.9% of the country's GDP in 1988, whereas that of Yugoslavia totalled 1% of its GDP (Petak, 1991: 72). The highest GDP share was allocated to the R&D sector in 2004 - 1.05%. Croatia cut its relative investment in science in 2006, 2007, and 2008 down to a GDP share of 0.76%-0.9% (source: *Eurostat*).

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The findings of this study point to other disciplinary differences in the media coverage of science also. The journalistic form reveals slight differences in media reporting on particular disciplines, as well as the domination of shorter and simpler journalistic forms, rather than more complex and comprehensive forms of journalistic expression. In spite of minor differences, the preferred journalistic form in both periods, as well as for all disciplines, remains the news, followed by the report. More demanding forms of reporting, which offer higher quality scientific articles ('stories'), providing the readership with adequate context, applicability of finding, and basically an analytical approach, are a rarity. This is not surprising, considering the lack of journalists specialising in science and of science sections in the Croatian press. Some studies (*e.g.,* Fenton *et al*., 1997; 1998) indicate that reporting in the field of social sciences more often takes on the form of the feature, rather than the news. This study denies this, although there has been a slight increase in the share of the feature in the later period. Furthermore, the slightly higher representation of the interview in humanities-related reporting could be a corroboration of the thesis on the role of the public intellectual, as suggested by Cassidy. However, previous findings in Croatia (Brajdić Vuković and Šuljok, 2005; Šuljok and Brajdić Vuković, 2013) indicate that the scientific community in Croatia barely participates in the public communication of science. Despite the formerly prominent function in demonstrating the 'scientifically' based and successful socialist order of Yugoslavia, the science research milieu seems to be characterised by public isolation. Croatia's deeply rooted socialist heritage, underdeveloped sphere of civil society and civic participation, declarative pro-scientific socialisation, 'unquestionable' public trust and support of science[18] which was 'achieved' partly through political/state propaganda rather than through active involvement of scientists in public dialogue, have resulted in the fact that Croatian scientists are just 'getting accustomed' to public communication and performing a public role. Therefore, a further study would be necessary to provide more information regarding the engagement of social and humanities scientists as expert commentators in the media space of Croatia.

Finally, the findings of this study show that the index of scientific background information in biomedicine-related articles is somewhat poorer. Although the media provide more information on the subject of science and health (in comparison with other disciplines), they fail to provide a more systematic analysis and evaluation. The findings do not confirm the thesis of the inferior status of social and humanistic disciplines, but they do corroborate the results of previous Croatian studies which established a poorer position of biomedicine-related articles. Earlier research (Brajdić Vuković and Šuljok, 2005; Šuljok and Brajdić Vuković, 2013) has shown that media trustworthiness, including the use of expert quotations, was lower in the case of biomedical news, which means that biomedical sciences fared the worst when it came to credible media reports of science content.

However, the aforementioned conclusions reveal a general journalist neglect of the 'science methodology' data in all scientific disciplines. The fact that the scientific background information index remains the same, despite the media transition, is a telling finding. In other words, the transition from state-controlled to market-controlled media

[18] The Croatian public still places a relatively high degree of trust in science and scientists (Prpić, 2011).

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did not entail an improvement in the quality of information (Jergović, 2004). Very few specialised science journalists, the lack of specialised education and courses in the training of journalists, few (or the lack of) science sections, as well as the continuing decline of professional and ethical standards of journalism (Jergović, 2004; Skoko and Bajs, 2007) are the factors that most certainly affected this data. However, the media image of science cannot, by any means, be seen as a reflection of scientific research and the criteria applied by the scientific community. The former insistence of researchers that methodological information ought to be included as critical, *i.e.*, necessary for a thorough journalist report on a science topic is now considered outdated. At the same time, this does not mean that the media do not have the responsibility of unbiased and objective reporting.

Finally, with regard to characteristics of reporting, I can only partially agree with the thesis on expanding the biomedical reporting pattern (homogenisation) to media coverage of other fields. News in general is becoming more similar and standardised, but the characteristics of biomedical news reporting in Croatia are somewhat different from the international trends described earlier. I believe that this 'homogenisation' is based primarily in the contemporary (including Croatia) media practice of placing emphasis on sensationalist stories and superficial processing. When it comes to reporting on science, this results in reducing science to 'sensational' new research discoveries, which are not linked to previous findings, theoretical assumptions, or potential uncertainties. In other words, the patterns of media communication of science in Croatia are not created in biomedicine-related reporting, yet they are defined by broader media changes and patterns, such as tabloidisation and sensationalism.

As a conclusion, the findings of this study confirm the hypotheses on specificities in media communication of particular scientific disciplines in different socio-political contexts, as well as a tendency of levelling media practices in line with global trends, such as growing orientation towards medicalisation and socio-spatial domination of 'Western' news.

The limitations of this study are partially due to the scope of daily newspapers that were analysed, which did not allow for analyses of individual dailies in different time periods, owing to the intense changes that occurred in the Croatian media. Secondly, this study was restricted to one country, although it would be interesting to expand the scope of analysis to national contexts beyond Croatia and compare the findings. In addition, further generalisations would require a deeper continuation of this study by analysing the patterns of interaction between the media and disciplinary scientific communities, the modes of creating news items within particular media and national contexts, as well as other aspects of media reporting.

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MEDIJSKO IZVJEŠTAVANJE O RAZLIČITIM ZNANSTVENIM DISCIPLINAMA U HRVATSKIM DNEVNIM NOVINAMA – DRUŠTVENO-POVIJESNA PERSPEKTIVA

Adrijana Šuljok

SAŽETAK *Cilj ovog istraživanja bio je utvrditi promjene u učestalosti i obilježjima medijskog izvještavanja o različitim znanstvenim disciplinama u društveno-povijesnom kontekstu u kojem nastaju. Istraživanje je provedeno metodom analize sadržaja koja je obuhvatila najčitanije hrvatske dnevne novine u dva vremenska razdoblja: „socijalističkom", od 1986. do 1988., i „demokratskom", od 2006. do 2008. Korištena je metoda konstruiranog tjedna za odabir ukupno 885 članaka. Nalazi potvrđuju specifičnosti medijske komunikacije pojedinih znanstvenih disciplina u različitim društveno-političkim kontekstima, kao i tendenciju ujednačavanja medijskih praksi u skladu s globalnim trendovima, kao što su rastuća orijentacija prema medikalizaciji i socioprostorna dominacija „zapadnjačkih" vijesti.*

KLJUČNE RIJEČI

ZNANOST, MEDIJSKO IZVJEŠTAVANJE, DNEVNI TISAK, DRUŠTVENO-POVIJESNI KONTEKST, MEDIKALIZACIJA

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