

Željko Pavić<sup>36</sup>  
 Marina Đukić<sup>37</sup>  
 Adrijana Šuljok<sup>38</sup>

## AGE DIFFERENCES IN THE RELATIONSHIP BETWEEN MEDIA USE AND ATTITUDES ABOUT VACCINATION<sup>39</sup>

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### Abstract

Theoretical approaches that analyze media effects can be divided into those which state that the impact is real, comprehensive and one-way, and those which state that there is a reversed causality, i.e. that values, characteristics and attitudes affect the way the media are used. In this paper, these approaches were developed on the example of the attitudes towards vaccination, a topic that has become an extremely important social and public health issue with the outbreak of the COVID-19 pandemic. The authors analyzed the data collected in a pilot study on attitudes towards vaccination conducted before the start of the COVID-19 pandemic on a convenience online sample of the Croatian population (N = 822). The results of the research study showed the lack of influence of television and the limited and uneven influence of the use of the Internet and Internet social networking sites on attitudes towards vaccination, i.e. on conspiracy beliefs in the field of vaccination. Namely, the research results revealed negative correlation between the Internet and SNSs use and conspiracy beliefs, which probably flows from the impact of social integration or the prevailing positive information that can be found about vaccination

36 Faculty of Humanities and Social Sciences, Josip Juraj Strossmayer University of Osijek, [zpavic@ffos.hr](mailto:zpavic@ffos.hr).

37 Academy of Arts and Culture in Osijek, Josip Juraj Strossmayer University of Osijek, [mdjukic@aukos.hr](mailto:mdjukic@aukos.hr)

38 Institute for Social Research in Zagreb, [adrijana@idi.hr](mailto:adrijana@idi.hr)

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online. Furthermore, age was proven to be a significant moderator variable, given that the negative correlation between time spent online and conspiracy beliefs is much stronger among younger people, and the moderating impact of time spent on social media moved to the opposite direction. The results of the research therefore indicate a need to better understand the use of old and new media, their communicative differences, age differences in their use, and other background variables that can lead to unequal influences of the media on different social groups.

**Key words:** age, Internet, media, social media, vaccination.

## Introduction

Attitudes toward vaccination have become an important public health issue in the recent decades, especially with the arrival of the COVID-19 health crisis, with an increasing number of research studies which try to identify the root causes of vaccine hesitancy, as well as the characteristics of anti-vaccination movements (Dubé *et. al.*, 2021). Among other causes, media usage has been selected as one of the most important determinants of vaccine hesitancy. Moreover, it has been proposed that the changed decentralized, pluralized and less controlled media environment is becoming more conducive to the more skeptical vaccination attitudes and behaviors, which can range from the mild doubts and hesitations, to the outright refusal of the vaccination schedules (Aquino *et. al.*, 2017; Broniatowski *et. al.*, 2018; Carrieri, Madio and Principe, 2019; Miškulin *et. al.*, 2022). Even in cases when such impact is not direct, negative information found on the Internet and social media might enhance already present concerns about vaccination (Pavić *et. al.*, 2022). On the other hand, it has been shown that people with more knowledge of science and technology more often use the Internet as their primary source of information in these domains when compared with people who are less knowledgeable (Anderson *et. al.*, 2010). Changing media environment and the appearance of new forms of science journalism, such as science blogs, might provide motivated individuals with new sources of rapid and relevant information which can act as a better bridge between scientists and general public with comparison to the traditional media outlets (Yi-Fan Su *et. al.*, 2015). Moreover, the so-called media complementarity theory (Dutta-Bergman, 2004)

posits that there is a tendency of audience reliance on multiple media formats, which are offering similar information due to use of similar news sources (Yuan, 2011). Thus, it is possible to hypothesize that both old and new media<sup>40</sup> can have a mainstreaming effect, even though the new media are much less centralized and controlled. For instance, a content analysis of Croatian online newspapers revealed that the coverage of COVID-10 vaccination issue during the pandemics was largely affirmative, with no significant difference between the online newspapers which are online versions of the national daily newspapers, on one side, and the online-only newspapers, on the other side (Pavić, Šuljok and Jurlina, 2022, forthcoming). Additionally, possible influence of new media on vaccine hesitancy does not necessarily need to be the same for all social groups, given that, generally speaking, media effects do not need to be universal in their direction and/or scope. For instance, it has been shown that the Internet exerts different impact on psychological well-being in younger and older adults, wherein the impact is negative among younger adults (Morahan-Martin & Schumacher, 2000; Sharma and Sharma, 2018), and positive among older adults (Wright, 2000; Heo et. al., 2015). Even though it is noted that younger persons are more likely to be vaccine hesitant (Khan, Watanapongvanich and Kadoya, 2021; Robertson *et. al.*, 2021), possible age differences in the media influence on vaccine hesitancy have not been explored until now. In this paper, we aimed to situate the issue of the media influence on vaccination hesitancy into a wider theoretical frame of the theories of media effects, and to test specific hypotheses regarding the direction of the media effects, possible differences between the old and new media, and the possible age differences in this regard. In other words, we aim to draw more theoretical conclusions from a specific research focused on vaccine hesitancy, thus making a bridge between specific research on vaccine hesitancy and the media, dominated by researchers with medical and public health background, and the more general field of media effects, dominated by communication researchers. With that in mind, we first provide an outline of the media effect theories and their dilemmas related

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40 In this paper we conventionally define new media (websites, video-games, social media, social networking services, etc.) as media outlets which use digital communication as the main communication vehicle, as opposed to old media such as television, radio and print media. The Internet as the communication vehicle, among other things, brings new types of experiences, ways of representing the world and new relationships between users and consumers and media technologies (Lister et al., 2009).

to the direction of causal links, as well as the strength and uniformity of media effects. After that, based on the results of a survey study, we test specific research questions related to the relationship between media use and vaccine hesitancy, with the special focus on the age differences. We close the paper by providing the tentative explanations of the results, and connecting them to the previously mentioned dilemmas in the field of media effects research.

## **A short overview of the media effects theories**

Media effects theories differ according to approaches that they use in order to explain how the media influence the attitudes and perceptions of the audience. Although there were significant changes in approaches during the last 60 years the main standpoint was to “explain the role that mass media have in improvement or aggravation of relations, values systems, society ideals and individuals that constitute these societies” (Turow, 2009: 214).

Most common media theories classification historically tended to emphasize three or four phase model with each phase characterized by either “significant” or “minimal” media effects (McQuail, 2010). More recent studies (Neuman and Guggenheim, 2011) however provide an alternative six-stage model of cumulative media effects theories. Since it is beyond the scope of this paper to elaborate on all of important media effects theories, here we will give a brief overview of the theories and approaches that analyze media effects divided into those which state that the impact is real, comprehensive and one-way, and those which state that there is a reversed causality, i.e. that values, characteristics and attitudes affect the way media are used. Within the first approach, the media was perceived as almighty. It was believed that on the basis of media content, a direct, linear and monocausal conclusion could be drawn about an identical impact on all recipients (Kunzik and Ziepfel, 2006: 157). Having in mind the fluid boundaries of each media effect phase and its general definition by emerging media technologies, this phase was characterized with “fear of the wide, overarching effects that emerging media like film and radio could have on society” (Borah, 2015: 1). Media content was thought to act as a magic bullet (firing the message directly into audience head without

their own knowledge – Magic Bullet Theory) or hypodermic needle (injection of the message into audience mind and it cause changes in audience behavior and psyche towards the message (Hypodermic needle theory) onto passive and irrational audience which equally responds on media content and without hesitation.

Second approach to media effects emphasizes that values, characteristics and attitudes affect the way media are used, starting in the early 1940s. At first, the media effects were considered as minimal, i.e. weak and limited, so the approach was usually called a limited effect model. The importance of these first theories is reflected by the appearance of intervening variables that modify the influence of the media, “although the influence of the media was still considered one-sided” (Kunzick and Ziepfel, 2006: 159). It was accepted that in addition to social environments (e.g. family and friends) which can affect the impact of media messages, the diversities in personality structure can lead to different media content perceptions. On these grounds Lazarsfeld and Elihu Katz developed concepts like “selective exposure” in order to enlighten the lack of media effects, modeled by Festinger’s (1957) cognitive dissonance. Festinger (1957) claimed that people not only tend to listen to opinions and select reading materials that are consistent with their existing beliefs, but they usually choose to be with people who are like themselves (Griffin, 2012: 219). Therefore, the public willingly chooses to consume media that aligns with their ideas, i.e. the audience will view and construe the medium’s content in a frame that supports their original ideals (Williams, 2018). Social environment as an intervening variable and influence of “others” on media messages impact was also explained by introduction of two-step-flow theory of the mass media. The first step is the direct transmission of information to a small group of people who stay well informed and in the second, those opinion-leaders pass on and interpret the messages to others in face to face discussion (Griffin, 2012:355). The primary proponents of this theory Lazarsfeld and Katz showed that a person’s interpretation of media content is based around the values of their social class or group (Danesi, 2013:293).

Significant change from limited effect model towards direct effect model coincided with the rise of television as a new media. Historically, this third phase “returns to the concept of powerful mass media” (as stated by Noelle Neumann in 1973) with transferred attention to long-term influence, cultural patterns, and institutional behavior (Borah, 2015:2).

The main question was no longer “What do media do to people?” but “What do people do with media?” Within Katz’s uses-and-gratifications approach research was focused not only on the communicator and media content but on active behavior of media recipients (Kunzick and Ziepfel, 2006: 160). This approach viewed the audience as active and goal-directed in its patterns of media consumption and offered an understanding of how audience needs and expectations are linked to media behaviors (Blumer&Katz, 1974). The deliberate personal media choice is emphasized in order to fulfill different purposes at different times (Griffin, 2012:359). Hence, individuals actively engage with particular media messages in order to satisfy their needs, i.e. gratifications they seek from those media.

Overall, as pointed out by Neuman and Guggenheim (2011: 169), it can be concluded that the media effects research has evolving character and moves from relatively simple models of persuasion and prospective change of attitudes, to the more sophisticated and layered models, as scholars successively address the conditions and context of communication effects.

## **Research questions and methods**

Following theoretical ideas and the rationale outlined in the introduction, three research questions were proposed and tested in this study:

RQ1. Is there a connection between the amount of use of television, the Internet and the Internet social networking sites and vaccination conspiracy beliefs?

RQ2. Is there a connection between the frequency of use of health information found on the Internet and vaccination conspiracy beliefs?

RQ3. Does age represent a moderator of the relationship between the stated media use and vaccination conspiracy beliefs?

The first research question aims to test whether there are overall effects of media use, which are related to the theories that posit that media have direct effects on their users. The second and third research questions are framed within the more nuanced theories which state that the causal link might be the opposite, going from the users to the media consumption (RQ2), or that personal characteristics, such as age, can moderate the media effects, i.e. that they are not general media effects as such (RQ3).

The research data come from a pilot study on attitudes towards vaccination conducted in June 2019 (before the start of the COVID-19 pandemic) on a convenience online sample of the Croatian population (N = 822). As the indicator of vaccine hesitancy, a scale of vaccination conspiracy beliefs designed by Shapiro et al. (2016). The scale comprises seven items, and it was already translated, validated and used in a research study in Croatia (Pavić and Šuljok, 2022). The total results were obtained by adding the scores on individual items. Therefore, the scale score ranged from 7 to 35. The frequency of finding health information on the Internet was measured on a 1 (“never”) to 5 (“very often”) scale. Level of education was measured on a scale ranging from 1 (“Secondary vocational school or less”) to 4 (“Master’s degree or higher”). The measurement of the other predictor variables was quite straightforward. Namely, the amounts of time spent on consuming the Internet and television contents, as well as time spent on the Internet social networking sites (SNS), were measured in hours, while the respondents’ age was measured in years. The sample description can be found in Table 1.

*Table 1 Sample description*

Variable	Mean / Percentage	Standard deviation
Gender	37.8% male; 62.2% female	-
Age (in years)	38.82	10.04
Education		
Secondary vocational or less	22.02%	-
Grammar school	12.41%	-
Undergraduates	18.00%	-
Graduates	47.57%	-
Internet use (time)	3.60	2.77
Internet SNS use (time)	1.72	1.84
Television use (time)	1.24	1.37
Health information Internet	3.02	1.03
Vaccination conspiracy beliefs	16.33	9.10

A more detailed description of the sample and data collection can be found in Pavić and Šuljok (2022).

The collected data were analyzed with a hierarchical linear regression analysis. All variables were grand-mean centered, given that interaction variables as predictors can give rise to multicollinearity problems. After the grand-mean centering was conducted, there was no indication of the collinearity, since the variance inflation factors ranged between 1 and 2. The inspection of the residuals also revealed no significant deviations from the normal distribution.

## Results

In order to gain the first insight into the study variables, in Table 2 the bivariate correlations are presented. We can note that vaccination conspiracy beliefs are positively connected to female gender, lower education, lower Internet use, lower Internet SNS use, and higher frequency of finding health information on the Internet. As for the age, older age is negatively correlated with Internet use, SNS use, and finding health information on the Internet, while there is a positive bivariate correlation between age and television use.

*Table 2 Intercorrelation matrix*

Variables	Gender	Age	Education	Internet use	Internet SNS use	Television use	Health inf. Internet	Vacc. consp.
Gender	1	0.06	0.04	0.24**	0.00	0.00	-0.23**	-0.24**
Age	0.06	1	0.04	-0.14**	-0.10**	0.15**	-0.10**	-0.06
Education	0.04	0.04	1	0.02	-0.10**	-0.11**	0.10**	-0.23**
Internet use	0.24**	-0.14**	0.02	1	0.56**	0.03	0.01	-0.22**
Internet SNS use	0.00	-0.10**	-0.10**	0.56**	1	0.12**	0.06	-0.07*
Television use	0.00	0.15**	-0.11**	0.03	0.12**	1	-0.02	-0.03
Health inf. Internet	-0.23**	-0.10**	0.10**	0.01	0.06	-0.02	1	0.16**
Vacc. consp.	-0.24**	-0.06	-0.23**	-0.22**	-0.07*	-0.03	0.16**	1

*Gender: Female = 0, Male = 1;*

*\* $p < .05$ , \*\* $p < .01$*

*Source: Authors*



As stated above, a hierarchical linear regression was conducted with vaccination conspiracy beliefs as the criterion variable. In the first step, all predictor variables were entered into the linear regression equation. In the second step, the interaction effects were also added. We can note that the predictors explained about 15% of the criterion variance, while the addition of the interaction effects did not significantly improve the prediction.

As for the predictors, from Table 3 we can observe that gender, education, time spent on the Internet and time spent finding health information on the Internet proved to be significant predictors of vaccination conspiracy beliefs, while the other predictors were not statistically significant. Namely, women on average scored 2.73 points higher on the vaccination conspiracy beliefs scale, while a one-point increase on the education scale decreases vaccination conspiracy beliefs by 1.39 points. A one-hour increase of time spent on the Internet lowers vaccination conspiracy beliefs by 0.60 points, while one-point increase on the Internet health information variable increases vaccination conspiracy beliefs by 1.23 points. As for the second model, we can note that the regression coefficients remained very similar, while the interaction effects of age and the Internet use, as well as age and the Internet SNS use, were also statistically significant. More precisely, the former interaction effect was positive, the latter negative, while the remaining interaction effects were not statistically significant. Since the two interaction effects were statistically significant, the interactions were probed by setting the interacting variables at the mean value, and one standard deviation above and below the mean. The probe showed that Internet use lowered vaccination conspiracy beliefs both among younger and older respondents, but this effect was much stronger among younger respondents. As for the Internet social networking sites, younger respondents who use the SNSs more often showed higher conspiracy beliefs than those who use SNSs less often. This pattern is reversed among older respondents, since those who use SNSs more often have lower conspiracy beliefs.

*Table 3 Hierarchical linear regression with vaccination conspiracy attitudes as criterion variable*

Variable	Model 1			Model 2		
	B	SE B	$\beta$	B	SE B	$\beta$
Gender	-2.73**	0.65	- 0.15	- 2.69**	0.66	- 0.14
Age (in years)	- 0.05	0.03	- 0.05	- 0.04	0.03	- 0.04
Education	- 1.39**	0.20	- 0.24	- 1.39**	0.20	- 0.24
Internet use (time)	- 0.60**	0.14	- 0.18	- 0.59**	0.14	- 0.18
Internet SNS use (time)	0.00	0.20	0.00	0.02	0.20	0.00
Television use (time)	-0.27	0.22	- 0.04	-0.28	0.22	- 0.04
Health information Internet	1.23**	0.30	0.14	1.22**	0.30	0.14
Age X Internet use				0.04*	0.01	0.10
Age X Internet SNS use				- 0.04*	0.02	- 0.09
Age X Television use				0.01	0.02	0.01
Age X Health information Internet				- 0.01	0.03	- 0.01
R2		0.15			0.16	
Adjusted R2		0.15			0.15	
R2 – change		0.15			0.01	
F for change in R2		21.17**			1.83	

*Gender: Female = 0, Male = 1;*

*\* $p < .05$ , \*\* $p < .01$*

*Source: Authors*

## Discussion

Overall, the study results did not confirm a uniform influence of the media on vaccination conspiracy beliefs. Moreover, the use of television did not prove to be a significant predictor at all, thus probably indicating a decreasing influence of television as a medium. As for new media, time spent on the Internet and time spent on SNSs had significantly different impact on younger and older persons, thus confirming that personal characteristics and social environment differentially shape media influences, as the second generation theories of media effects would suggest.

More specifically, study results confirmed age differences in media use, given that older respondents more often used television, while younger

more often relied on the Internet. The latter also included searching for health information on the Internet. However, a more important finding is related to the established interaction between age and the Internet and SNS use. The pattern of the age-Internet use interaction can be tentatively explained by the possible proxy function of the Internet use or its consequences on social capital of users. Namely, Internet use may indicate the level of social integration, which might or might not be the direct effect of Internet use. The results of our study indicate such possibility both among younger and older persons. However, among younger respondents, rare use of the Internet may indicate even higher social isolation in comparison to the peers who use the Internet more often, which may further be connected with lower level of trust in social institutions, and finally to the higher vaccination conspiracy beliefs. On the other hand, the pattern of age-SNS use interaction might be explained by the different usage habits among the age groups, i.e. on the consequences of the use related to social capital. In other words, older respondents may be more selective when choosing SNS contacts, thus less often exposing themselves to the contacts who provide vaccination conspiracy beliefs. For instance, Heo *et. al.* (2015) found that higher levels of Internet use were significant predictors of higher levels of social support, reduced loneliness, and better life satisfaction and psychological well-being among older adults. On the contrary, the meta analysis conducted by Lui *et. al.* (2018) showed that there is a medium-sized negative correlation between the heavy Internet use and social support among teenagers and young adults. Therefore, it seems that older persons are more successful in drawing positive social capital from their Internet use, possibly helping them to overcome the problems of social isolation. On the other hand, for younger respondents, online social contacts have less potential for doing the same. For instance, Longest and Kang (2022) found that during the COVID-19 pandemics young adults had the lowest level of depression symptoms when they had a higher level of offline emotional support and a lower level of online informational support.

Alternative explanation rests on the assumption that younger people who have more SNS contacts on average, might be exposed to the more negative influences, in this case negative information about vaccination. Namely, as younger people have generally more negative attitudes about

vaccination, their online social contacts may have more negative impact in comparison to the older persons and their online social contacts.

Positive correlation between the frequency of finding the health information on the Internet and vaccination conspiracy beliefs can be explained in two ways. The first one rests on an assumption that the majority of the Internet health information is negatively oriented towards vaccination, which is hard to sustain, given the significant overlap between offline and online media noted earlier (Dutta-Bergman, 2004). The other explanation posits that the persons who are generally more anxious about their health and trust less more common sources of health information (medical experts) will more often look for the health information online. In this explanation, the causal link flows from the users to the media content choice, thus confirming the media effects approaches, such as the so-called uses and gratification theory, which claim that people choose which media to use and how to use them, instead of being media “victims”.

## Conclusions and limitations

Our study extends previous research on the relationship between media use and vaccine hesitancy and the age differences in media use by pointing out possible differences in media effects outcomes that can be attributed to the aforementioned age differences. Namely, our study suggests that the overall use of the Internet and Internet social networking sites have different effects on vaccination conspiracy beliefs across age groups. Additionally, the positive correlation between finding health information on the Internet and vaccination conspiracy beliefs indicate a more active role of media consumers than the theories of the strong and uniform media effects would suggest. Overall, the study results suggest that media effects should be researched by acknowledging individual and social characteristics which filter media influences and make them variable, uneven and sometimes weak.

However, our study has several limitations. First, the cross-sectional nature of our research design and the convenience sample employed in the study make it hard to draw reliable substantive conclusions. Second, our operationalization of media consumption was limited to the time spent on the Internet and SNSs, a very general measure which does not tap into

different ways in which that time can be spent. Additionally, in our study social integration and social support were not measured, which make our explanations of the age differences indirect and tentative. Therefore, future research should aim to explain the age differences in more detail, and to connect them with explicitly measured social integration and social support. And fourth, it should be emphasized again that the data were collected before the COVID-19 pandemic, which makes it hard to say whether the influences noted above are still valid in the new social circumstances.

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## DOBNE RAZLIKE U VEZI IZMEĐU UPOTREBE MEDIJA I STAVOVA O CIJEPLJENJU

### Sažetak

Teorijski pristupi koji analiziraju medijske učinke mogu se podijeliti na one koji smatraju da je taj utjecaj stvaran, sveobuhvatan i jednosmjernan te one koji smatraju da je riječ o obrnutom kauzalnom učinku, odnosno da vrijednosti, obilježja i stavovi osoba utječu na način upotrebe medija. U ovom se radu navedeni pristupi testiraju na primjeru stavova o cijepljenju, teme koja je izbijanjem COVID-19 pandemije postala iznimno važno društveno i javnozdravstveno pitanje. U radu autori analiziraju podatke prikupljene u pilot istraživanju o stavovima o cijepljenju napravljenom prije početka COVID-19 pandemije na prigodnom online uzorku stanovnika Hrvatske (N = 822). Rezultati istraživanja pokazali su nepostojanje utjecaja televizije te ograničen i nejednolik utjecaj upotrebe interneta i internetskih društvenih mreža na stavove o cijepljenju, odnosno na konspiracijska uvjerenja u području cijepljenja. Nasuprot pretpostavljenoj pozitivnoj korelaciji vremena provedenog na internetu i konspiracijskih uvjerenja, rezultati istraživanja pokazali su da je ova korelacija negativna, što vjerojatno održava utjecaj društvene integracije ili prevladavajuće pozitivne informacije koje se o cijepljenju mogu naći na internetu. Nadalje, dob se pokazala kao značajna moderatorska varijabla, s obzirom na to da je negativna korelacija vremena provedenog na internetu i konspiracijskih uvjerenja mnogo jača kod mlađih osoba, a moderatorski utjecaj vremena provedenog na društvenim mrežama suprotnog je smjera. Rezultati istraživanja stoga upućuju na potrebu da se bolje razumije način upotrebe starih i novih medija, njihove razlike te dobne razlike u upotrebi ili drugim pozadinskim varijablama koje mogu dovesti do nejednolikih utjecaja medija na različite društvene skupine.

**Ključne riječi:** cijepljenje, dob, društvene mreže, internet, mediji.