How Social Media, News Media and Interpersonal Communication Relate to Covid-19 Risk Perceptions and Behaviours

A Daily Diary Study

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Abstract
To inhibit the spread of the Covid-19 virus, several governmental guidelines (e.g., social contact, vaccination) were proposed. Whether or not these protective behaviours are implemented often depends on citizens’ risk perceptions which, according to previous research, are formed by social media, news media, and interpersonal communications. However, previous research is limited in two ways. First, research mostly focused on adults, thereby neglecting emerging adults who are less affected but equally needed to adhere to the rules. Second, research mainly measured behaviours at one-time point and studied between-person associations, thereby neglecting short-term within-person effects. We therefore conducted a daily diary study among 208 emerging adults ($M_{age} = 21.63$, $SD_{age} = 1.15$) and examined which communication channels increased Covid-19 risk perceptions (i.e., perceived personal susceptibility and societal severity) and, in turn, individuals’ willingness to get vaccinated and follow Covid-19 rules. The results showed that only news media predicted societal severity on the within-level and that severity, in turn,
predicted willingness to get vaccinated and follow rules at the between-level. Additionally, social media predicted interpersonal conversations about Covid-19 at the between-and within-level. Overall, this study highlights the importance of news media in affecting emerging adults’ health perceptions and behaviours during a crisis.

**Keywords**
Risk perceptions, Covid-19, news media, social media, vaccination.

According to reports from the World Health Organization, Covid-19 has already resulted in more than 300 million confirmed cases and more than 5 million deaths globally (World Health Organization, 2022). Because of these numbers, governments implemented rules that assist in inhibiting virus spread (e.g., social distancing, hygiene instructions, travel restrictions) and provided vaccines that protect against Covid-19 (Friemel & Geber, 2021; Kessels et al., 2021). However, whether or not government recommendations are being followed and translated into actual behaviour depends on citizens’ willingness to follow risk-inducing guidelines.

Building on the extended parallel process model (EPPM; Witte, 1992) and the social amplification of risk framework (SARF; Kasperson et al., 1988), individuals’ willingness to engage in risk-inducing behaviour depends on their perceived susceptibility, i.e. the likelihood of contracting a disease, and perceived severity, i.e. the severity of a disease. These risk perceptions are often formulated through communication channels as research indicates that interpersonal communication, social media and news media affect individuals’ risk perceptions (Morton & Duck, 2001; Schweisberger et al., 2014; Tyler & Cook, 1984). Moreover, these channels also seem to influence each other as media exposure often precedes interpersonal communication (Jeong et al., 2015; Jones et al., 2007; Karletsos et al., 2021), which, in turn, guides individuals’ risk perceptions. Some studies have examined whether this also seems to be the case when looking at Covid-19-related risk communication (First et al., 2021; Ranjit et al., 2021; Rozendaal et al., 2021). However, two important limitations prevail.

First, previous studies mostly sampled broad age groups, thereby neglecting the fact that different groups might use different communication channels. An important group worth examining are emerging adults because they are to a large extent not personally affected (mostly [older] individuals with bad health) but equally needed to combat Covid-19 (Sciensano, 2020). Consequently, it is important to understand which communication channels should be used to increase risk perceptions among this group.

Second, previous studies were mostly cross-sectional and examined communication channels, individuals’ risk perceptions and behaviours at one-time point, thereby looking at between-person associations (First et al., 2021; Zhao & Wu, 2021). However, since media-effects are likely to occur at the within-person level (Curran & Bauer, 2011), research should also study within-person effects. Moreover, given that media coverage and interpersonal conversations about Covid-19 might differ from day to day in turbulent times, one should specifically study short-term within-person effects. Daily diary designs, which make it possible to measure behaviours within persons and over days, are hence necessary.

Our research aims to fill these two gaps by conducting a daily diary study among emerging adults (18-25 years). More specifically, building on previous theoretical insights and findings (First et al., 2021; Karletsos et al., 2021; Kasperson et al., 1988), we will examine (1) whether exposure to Covid-19 information through various communication channels (interpersonal...
communication, news media, social media) differently predicts emerging adults’ risk perceptions (i.e., personal susceptibility and societal severity), (2) whether interpersonal communication operates as an indirect factor in the associations between media channels and emerging adults’ risk perceptions, and (3) whether these risk perceptions, in turn, predict emerging adults’ Covid-19-related behaviours (i.e., willingness to follow Covid-19 rules and get vaccinated). These associations will be studied both at the between- and within-person level to see whether previously found associations can also be replicated on the daily/within-person level.

**Covid-19 Nonpharmaceutical and Pharmaceutical Measures**

The spread of Covid-19 has challenged governments to introduce regulations that assist in sustaining the healthcare system. These regulations varied from nonpharmaceutical to pharmaceutical measures (World Health Organization, 2021). Nonpharmaceutical measures consisted of health protection measures that could be implied by the individual, such as keeping a safe distance (e.g., 1.5m distance), ensuring good hygiene (e.g., washing hands, mouth mask) and limiting displacements (Belgische-federale-overheidsdiensten, 2020). Pharmaceutical measures included creating vaccines that protect individuals from getting infected which, in turn, is beneficial on the societal level (Kessels et al., 2021). If the vaccination rates in a society increase, the majority of people will be less likely to get infected with Covid-19, making it harder to spread the virus from person to person (Kessels et al., 2021). However, the fact that government guidelines are used to inhibit virus spread does not mean that people will automatically implement them. Often the successes of these measures depend on people’s willingness to follow regulations and implement health-beneficial behaviour (Friemel & Geber, 2021).

**Covid-19 and Perceived Risk**

According to the EPPM, people’s implementation of a recommended health behaviour depends on their perceived threat of a situation (Witte, 1992), often also seen as an individual’s estimation to experience adverse consequences on one’s health in a specific situation. Building on Choi et al. (2017), this perceived threat consists of two dimensions: susceptibility and severity (Pask & Rawlins, 2016). Susceptibility reflects a person’s perception of how likely they are to contract a disease, whereas severity refers to a person’s perception of how serious and/harmful this disease is (Choi et al., 2017). Both susceptibility and severity can be further divided into a personal and societal component, with personal referring to beliefs about the self-concerning some risk, and societal referring to beliefs about others (e.g., peers, nation, world population) concerning some risk (El-Toukhy, 2015; Tyler & Cook, 1984).

These risk perceptions, specifically regarding Covid-19, might vary substantially across different demographic groups as the perceived level of risk might be high among certain age groups but not among others. For example, emerging adults (18–25-year-old) are important to consider as they are to a large extent not personally affected by Covid-19. Even though emerging adults can get infected with Covid-19, the risk of getting severely ill is low in comparison to older cohorts (Sciensano, 2020). As a result, they might hold high risk perceptions of getting infected themselves (personal susceptibility), but low risk perceptions of getting severely ill (personal severity). Consequently, they might invest less effort in Covid-19 avoidant behaviours, as can be illustrated by the low compliance rates with public health measures among this group (Nivette et al., 2021). Still, it is important that this group adheres
to the rules and gets vaccinated as this can prevent them from infecting other at-risk individuals who do get severely ill. As such, for emerging adults to comply with health measures, it might be more effective to target their perceived personal susceptibility, to raise awareness that they can contract Covid-19 themselves, but more importantly also their societal severity, to raise awareness that others get severely ill of Covid-19. Building on the SARF (Kasperson et al., 1988), our study will examine which communication channels can steer emerging adults’ perceived personal susceptibility and societal severity, advancing previous studies that mainly looked at the adult population (Friemel & Geber, 2021; Kessels et al., 2021).

**Communication Channels and Risk Perceptions.** Interpersonal communication networks might be important in guiding risk perceptions because especially during Covid-19 people reached out to others for comforting conversations (Skalacka & Pajestka, 2021). Wagner and Reifegerste (2021), for example, indicated that Covid-19 was a ubiquitous and recurring topic in individuals’ everyday conversations with others ranging from discussing health measures to dealing with emotional strains. These interpersonal conversations may, in turn, amplify or attenuate risk perceptions by providing information or reinforcing habitual perceptions and cultural biases (Kasperson et al., 1988). First et al. (2021, p. 103), for example, mentioned that “when talking about Covid-19, individuals may encounter distressing descriptions of Covid-19 experiences from others, which may result in increased worry or anxiety”. Building on the differential impact hypothesis (Basil & Brown, 1997), which argues that emotional components (e.g., feelings of worry and anxiety) are linked with personal-level risk perceptions (Morton & Duck, 2001), we therefore hypothesise that interpersonal communication about Covid-19 more strongly predicts individuals’ personal susceptibility to getting infected rather than societal severity.

**H1:** Individuals who have more interpersonal communications about Covid-19 than others will also have a higher perceived personal susceptibility in comparison to societal severity.

Second, apart from interpersonal communication, traditional news media channels (e.g., television, internet, radio, newspapers) also play an important role in shaping individuals’ risk perceptions because they can deliberately determine which risks will be portrayed and how these risks will be portrayed (First et al., 2021; Kasperson et al., 1988; Morton & Duck, 2001). Declercq et al. (2021) showed that, during Covid-19, newspapers mostly reported on the number of infections and deaths, albeit in different ways. Whereas Mach et al. (2021) indicated that Covid-19 coverage in newspapers had low sensationalism and more scientific quality, Ogbodo et al. (2020) found that human interest and fear/scaremongering frames dominated the media coverage of Covid-19. As follows, exposure to a mixture of scientific and sensational news topics might have impacted both societal severity and personal susceptibility (Oh et al., 2015; Paek et al., 2016; Wu & Li, 2017). Research of Wu and Li. (2017) on the Haze Issue in China, for example, already showed mass media play a role in both personal and societal risk perceptions. This can be explained by the impersonal impact hypothesis (Tyler & Cook, 1984) and the differential impact hypothesis (Basil & Brown, 1997). On the one hand, the informational portrayal of risks might not have felt personally relevant to individuals and might have more likely affected the cognitive dimension of risk judgments and individuals’ perceived societal severity (McComas, 2006; Morton & Duck, 2001). On the other hand, the more emotional portrayal and fear/scaremongering framing of health threads could have made them
more salient and personally relevant, thereby more likely affecting individuals’ perceived personal susceptibility (Paek et al., 2016; So et al., 2011).

**H2:** Individuals who are exposed to more news media messages about Covid-19 (i.e., television, internet, radio, newspapers) than others will also have a higher perceived personal susceptibility and societal severity.

Last, specifically during Covid-19, social media channels may be important in individuals’ risk perceptions (Friemel & Geber, 2021; Ranjit et al., 2021). From a media perspective, Covid-19 is different from prior pandemics in that social media came to play a crucial role in both information dissemination and social relationship maintenance due to the implemented lockdowns (Beaunoyer et al., 2020; Tsao et al., 2021). This might have resulted in exposure to a greater diversity of information and opinions (McEwan et al., 2018), while simultaneously opening the gate for misinformation (Stubenvoll et al., 2021). The topic analysis of Chipidza et al. (2021), for example, showed that Covid-19 topics on social media mostly consisted of personalised opinions (e.g., about school closures, working from home, and supply shortage in supermarkets), and that people often used social media to spread information on possible prevention measures and cures. This, in turn, often resulted in misinformation (e.g., use of sodium ascorbate, zinc and vitamin c to cure Covid-19; Chipidza et al., 2021), which has been proven to enhance anxiety and psychological distress (Rocha et al., 2021). Research by Alrasheed et al (2022), for example, already showed that exposure to social media about Covid-19 led to higher fear perceptions and, importantly, personal-level risk perceptions. As follows, building on previous insights, we expect that social media, which portray personalised topics and fearmongering misinformation, might make risks more personally relevant, thereby more likely affecting individuals’ perceived personal susceptibility.

**H3:** Individuals who are exposed to more social media messages about Covid-19 than others will also have a higher perceived personal susceptibility in comparison to societal severity.

**Overlapping Communication Channels.** Instead of separately studying communication channels that guide individuals’ risk perceptions (Ranjit et al., 2021; Rozendaal et al., 2021), it is also important to account for the overlapping possibility of channels. In the rapidly changing media landscape, it is nowadays difficult to straightforwardly say what individuals may have seen and where they might have gotten their information. They might, for example, see an article on a traditional news website and further spread this using their own social media channels. Furthermore, they might encounter a peer commenting on a news article on social media, thereby rendering the question of what type of news this is. The border between traditional and social media has, thus, blurred (Manganello et al., 2020).

This overlapping possibility of communication channels might be particularly true for emerging adults. Whereas adolescents initially form a set of worldview beliefs based on the news media habits of their parents, a generation known for traditional news media consumption (Edgerly et al., 2018), emerging adults re-examine these beliefs and form a set of beliefs based on their own independent selection of communication channels, which often entails a combination of different sources including traditional and online news sources (Antunovic et al., 2018). Moreover, research has shown that emerging adults tend to rely on peers to make sense of and validate news topics (Arnett, 2000; Podschuweit, 2017; Yang & Stone, 2009). For instance, Peters et al. (2022) found that news topics often served as ‘small talk’ within emerging
adults’ offline social networks. This finding aligns with the two-step flow of communication (Katz & Lazarsfeld, 1955) which argues that the influence of media content does not unfold directly but is exerted or mediated through the personal networks in which people are embedded (Hepp, 2019). Building on the two-step flow of communication, it is thus interesting to examine whether Covid-19-related news topics also provoked interpersonal conversations which, in turn, may have attenuated or amplified emerging adults’ risk perceptions. Consequently, in our research, we aim to capture the intermingling possibility of communication channels by proposing the following research questions:

**RQ1**: Does Covid-19 news exposure have an indirect effect on risk perceptions (i.e., societal severity and personal susceptibility) via interpersonal communication?

**RQ2**: Does Covid-19 social media exposure have an indirect effect on risk perceptions (i.e., societal severity and personal susceptibility) via interpersonal communication?

**Risk Perceptions and Willingness to Implement Follow Rules.** Previous research has shown that risk perceptions play a role in individuals’ willingness to implement risk-inducing behaviours (Witte, 1992). However, ambiguous results seem to prevail as some research indicated that perceived severity rather than susceptibility steers health behaviour (Carpenter, 2010; Ranjit et al., 2021), whereas other scholars show that it might be the other way around (Ferrer & Klein, 2015). Our research will contribute to these mixed findings by examining whether perceived personal susceptibility might more likely predict compliance to individual health protection measures (i.e., social distancing, hygiene instructions, travel restrictions), while perceived societal severity might more likely predict compliance to measures framed in the broader collective such as getting vaccinated. Given the inconsistencies in the literature, we propose the following research questions:

**RQ3**: Are individuals who score higher on perceived personal susceptibility than others also more willing to follow Covid-19 rules (in comparison to getting vaccinated)?

**RQ4**: Are individuals who score higher on perceived societal severity than others also more willing to get vaccinated (in comparison to following Covid-19 rules)?

**The Importance of Within-Person Effects**

Although previous studies have provided important insights into the associations between communication channels and individuals’ risk perceptions and behaviours, they mostly did not take into account that media coverage and interpersonal conversations (about Covid-19) might change from day to day (Ford, 2021; Zhang et al., 2021). Expect for one study by Rozendaal et al. (2021), research measured participants’ behaviours and risk perceptions at one-time point, thereby forgetting that risk perceptions are often related to specific situations and are, therefore, not always accurately captured by using retrospective measures (Hogarth et al., 2007). Furthermore, even if behaviours were measured over days (Rozendaal et al., 2021), research mainly looked at between-person associations, thereby neglecting that media-effects are likely to occur within persons (Curran & Bauer, 2011). For example, rather than examining whether emerging adults who interact more with certain media channels than others also have higher risk perceptions than others (between-level), research should examine whether individuals report higher risk perceptions on days that they also interacted with more media channels than usual (compared to their own mean; within-level). Our research will account for daily changes in behavior within emerging adults by examining whether the above-mentioned hypotheses...
also hold on the within-person level. Given that our research is one of the first to study this, we propose the following research questions:

- **RQ5**: Do the between-person hypotheses (H1-3) also hold on the within-person level?
- **RQ6**: Do the between-person research questions (RQ1-4) also hold on the within-person level?

**Method**

**Study Context**

This study was conducted between March and April 2021, when approximately one year had passed since the first Covid-19 measures were implemented in Belgium on 18 February 2020. In this year, two lockdowns were already imposed in March and October 2020, of which the second one ended in February 2021. One month later in March 2021 (the time of this study), a third lockdown ‘light’ was proclaimed due to the rising infections and deaths. This means that only essential stores (e.g., food stores and pharmacies) remained open, whereas entertainment facilities and nonessential stores (e.g., bars and clothing stores) were closed. Moreover, severe social restrictions were imposed, such as meeting with a maximum of four people outside, and a travel ban was implemented. Although this lockdown was similar to the previous ones, the third lockdown might have weighed more heavily on inhabitants as the measurements were reimplemented just one month after being ‘freed’ from the second lockdown. Subsequently, compliance with the Covid-19 guidelines might have decreased (Franzen & Wöhner, 2021). When interpreting the results, one should take the particular Covid-19 context, and even time frames within this context (e.g., study during the first vs third lockdown), into account.

**Procedure**

Due to social restrictions, the recruitment procedure occurred online. Participants were reached through social media platforms and personal contacts by research assistants. Interested participants then received an information brochure about the procedure of the study and the confidentiality of their participation. After obtaining consent, participants could enrol in the study.

First, participants had to fill in a pre-survey that measured demographic variables (e.g., age, education). One week later, participants enrolled in the daily diary study, consisting of one assessment per day for 10 consecutive days. The daily survey consisted of 43 items and was spread using a Qualtrics link. Research assistants sent out text messages containing the link around 9 p.m. After receiving this message, respondents had 4 hours (until midnight) to complete the questionnaire. If two questionnaires had the same date, and were thus filled in on the same day, both were deleted from the dataset. If they forgot to fill in the survey, participants could re-join by answering the survey the next day after receiving a new text message. In the end, participants were thanked for their participation and had the chance to win a gift voucher. Only participants that had filled in eight or more surveys were included in the lottery. The study was approved by the university’s ethics committee.
Participant Sample
Initially, 208 emerging adults filled in the pre-test. However, for our final sample, we only included participants that had filled in 30% of the days (≥ three days of surveys) because three-time points are advised to study within-person effects (Singer & Willett, 2003). In addition, some participants had to be dropped because of missing/incorrect identification numbers, resulting in a final sample of 171 emerging adults. Of this sample, 126 (76%) were female and their average age was 21.56 (SD = 1.29). 38 respondents were currently following a professional bachelor’s program and 132 respondents were following an academic bachelor’s or master’s program. One respondent did not follow higher education.

Measurements

Daily Diary Measures

(Social) Media Exposure Covid-19. To measure participants’ exposure to Covid-19 media content, they first answered if they came across any information regarding Covid-19 in the media since completing the previous survey with (1) yes or (2) no. If yes was indicated, a follow-up question appeared which measured the media channel on which they saw this information varying from (1) social media (e.g., Facebook, Twitter), (2) news media – television (e.g., the news), (3) news media – online (e.g., website newspaper), (4) news media – radio, (5) news media – newspaper and magazine, and (6) other. To measure participants’ exposure to news media, all news media options were combined into one variable ‘News media Covid-19’ and to measure the variable ‘Social media Covid-19’, the answer option social media (e.g., Facebook, Twitter) was used.

Interpersonal Communication Covid-19. Interpersonal communication about Covid-19 was measured by asking participants “Did you talk to other people about Covid-19 today?”. Answer options were (1) no, (2) yes, with friends, (3) yes, with parents, (4) yes, with other peers, (5) yes, with other adults, and (6) yes, with other people. This variable was then transformed into a dichotomous variable that measured whether they had talked about Covid-19 with others.

Perceived Threat. Perceived societal severity was measured based on the scale used by Nazione et al. (2021). Participants were asked “At this moment, to what degree do you perceive the coronavirus to be a major risk to societal health?”. This could be answered on a VAS scale ranging from (1) no risk at all to (7) very high risk.

Perceived personal susceptibility was measured similarly but more closely related to the self. In particular, building on Eichenberg et al. (2021), participants were asked “At this moment, how big is the chance that you will get infected with the coronavirus?” ranging from (1) very small to (7) very large.

Willingness to Implement Health Behaviour. To assess the extent to which participants would follow non-pharmaceutical measures, participants had to answer how willing they would be at this moment to follow (a) rules regarding social contact (i.e., 1.5 m, max 4 people outside, …), (b) rules regarding traveling, and (c) hygiene rules (i.e., washing hands, mouth mask, …) on a 5-point Likert scale ranging from (1) not willing at all to (5) very willing. All three options were combined to measure ‘Willingness to follow Covid-19 rules’. The pharmaceutical Covid-19 measure was measured similarly but participants had to indicate how willing they would be to get vaccinated at this moment.
Pre-test: Control Variables. In the pre-test, participants’ age (“What’s your year of birth?”) and gender (1 - Male, 2 - Female, 3 - X), were measured, which were also used as control variables in the analyses.

Data Analysis
First, descriptive statistics, within-and between-person correlations, and statistical plots were generated to gain initial insights into our data. To test the hypothesised model, we then conducted a path analysis (Wright, 1934). Given that daily measurements were nested within participants, we estimated multilevel models for every endogenous variable in our path model, resulting in a total of five models to be tested. The first model predicted interpersonal communication through social media and news exposure (Model A). The second and third models predicted societal severity (Model B) and personal susceptibility to Covid-19 (Model C) through interpersonal communication and media variables (i.e., news and social media). Finally, the fourth and fifth models predicted willingness to get vaccinated (Model D) and follow Covid-19 rules (Model E) through societal severity and personal susceptibility.

All models were constructed and analysed similarly. That is, we first estimated intercept-only models, which were used to calculate the Intra-class Correlation Coefficient (ICC). Then random intercept models were created by adding level-two control variables (i.e., gender and age) and level-one predictors to the ‘empty’ models. All level-one predictors were centered both at the between- (i.e., overall mean of all assessments) and within-person level (i.e., subtracting individuals’ mean from their daily assessments), making it possible to calculate between-and within-person effects (Lewis et al., 2020; Masur, 2018).

For all models, assumptions were checked (e.g., heteroscedasticity, normal distribution of residuals) by plotting the residual variance and creating histograms and qq-plots (see Appendix for plots1). Furthermore, we also checked whether assessments of individuals were correlated by applying Likelihood-ratio-tests. The models accounting for autocorrelation fitted substantially better in every case, indicating the necessity to specify it. The packages nlme_3.1-142, performance_0.4.8, and esmpack_0.1-17 of R version 3.6.2 were used for the analyses. All code used for the analyses is available on the OSF platform https://osf.io/etk4p.

Results

Daily Assessments
In total, 171 participants completed 1341 out of 1710 assessments rendering the average compliance rate to 78.42%. More specifically, participants on average filled in 7.84 assessments ($SD = 2.13$) with a range of 3 to 10 assessments. The average completion time was 208 seconds (3.47 minutes).

Descriptive Statistics
In 1049 assessments, respondents reported seeing Covid-19 information in the media. In 671 cases, this was information on social media, followed by the news media outlets, i.e. websites of news media (487), television (424), radio (176) and newspapers/magazines (105). Respondents were then further asked for the type of information they were exposed to on social and news media. In 28.86% of the total assessments, respondents were exposed to vaccine-
related information on social media, while for news media this was only the case in 19.31% of the assessments. In addition, in 24.61% of the assessments, participants saw information related to Covid-19 statistics on social media, while they saw the same information on traditional news media in 17.97% of assessments. Overall, respondents saw more Covid-19 information on social media than on traditional news media.

As for Covid-19-related risk perceptions, participants mostly perceived the threat of getting infected themselves ($M = 3.25$, $SD = 1.52$) and the threat for society ($M = 3.79$, $SD = 1.52$) to be somewhere in the middle between 1 (very low) and 7 (very high). In addition, based on the means, it seemed that participants were mostly willing and even very willing to get vaccinated and follow Covid-19 rules (Table 1). This, in turn, did not seem to fluctuate much over days as can be seen in Figure 1.

The correlational between-level analysis (Table 1) showed that being female is associated with a higher perceived societal severity, personal susceptibility, willingness to follow Covid-19 rules and get vaccinated. Furthermore, it seems that news media exposure is associated with societal severity, willingness to get vaccinated and follow Covid-19 rules, while social media exposure is only weakly associated with personal susceptibility. Interpersonal communication is not related to willingness to get vaccinated or follow the rules, but it is correlated with social media exposure and personal susceptibility. In addition, while both societal severity and personal susceptibility were associated with the willingness to follow Covid-19 rules, only societal severity was associated with the willingness to get vaccinated. This, however, was not the case on a daily level. More information on the daily level correlations can be found in the Appendix (Table 2).

**Table 1.** Global Means, SDs, and Between-Person Correlations.

<table>
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<th>M</th>
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<td>.01</td>
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<td>.26**</td>
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<td>.07**</td>
<td>.05</td>
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<td>.19**</td>
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*Note. M and SD are used to represent mean and standard deviation, respectively. *$p < .05$, **$p < .01$. 
Figure 1. Daily Variations in Willingness to get Vaccinated and Follow Covid-19 Rules

Note. The X-axis displays the days of the study and consists of 10-time points. The Y-axis displays a person’s willingness to get vaccinated and follow Covid-19 rules on a given day. The identification numbers of the participants are provided above the graphs. Day = Day of the daily diary study.

Path Model

The proposed hypotheses and research questions were tested as part of a path model (Figure 2), which was obtained from testing the five models. The results of these models can also be found in the Appendix.4

H1 to H3 tested to what extent exposure to Covid-19 information in news and social media as well as interpersonal communication about Covid-19 predicted individuals’ societal severity (Model B) and personal susceptibility (Model C). The ICC for the intercept-only model of societal severity was .68 and for the personal susceptibility model this was .65, indicating that the majority of variance could be attributed to between-level differences. When looking at the hypotheses separately, we could see that H1 was rejected because the path analysis showed that there were no significant between- or within-person effects between interpersonal communication about Covid-19 and individuals’ societal severity and personal susceptibility. In addition, H2, which assumed that exposure to Covid-19-related news media would predict both societal severity and personal susceptibility, was only partly confirmed as news media predicted societal severity but not personal susceptibility (Tables 4 and 5, Appendix).
Moreover, we only found a significant effect on the within-person level \((b = .13, p < .050)\), meaning that on days that respondents were exposed more to Covid-19-related news media than their individual means, they also perceived the pandemic to be more severe. Last, H3 expected that exposure to Covid-19 information on social media would more strongly predict personal susceptibility than societal severity but this was also not confirmed as no significant associations at the between-or within-person level were found (Tables 4 and 5, Appendix). Overall, when looking at research question 5 on the within-person level, it thus seems that only H2 showed significant results on the within-person level.

For RQ1 and RQ2, we tested the indirect effect of exposure to Covid-19 media messages on individuals’ risk perceptions via interpersonal communication. For this, we first tested whether exposure to news and social media could spur interpersonal conversations about Covid-19 in Model A (Table 3, Appendix). The ICC for the intercept-only model of interpersonal communication was .17 indicating that only 17% of the variance could be attributed to differences between respondents. In addition, we found that exposure to social media messages about Covid-19, but not news media, predicted interpersonal communication at the between \((b = .19, p < .050)\) and within-person level \((b = .10, p < .010)\). However, as mentioned in the results of H1, interpersonal communication did, in turn, not predict personal susceptibility or societal severity.

Finally, for RQ3 and RQ4 the relationships between individuals’ risk perceptions and their willingness to get vaccinated (Model D) and follow Covid-19 rules (Model E) were tested (Tables 6 and 7, Appendix). The ICC of the intercept-only model of willingness to get vaccinated was .83 and willingness to follow rules was .80, indicating that more than 80% of the variance can be attributed to differences between respondents in both models. For RQ3, no substantial between-or within-person relationships were found between personal susceptibility and the willingness to get vaccinated or follow Covid-19 rules (Tables 6 and 7, Appendix). However, for RQ4, we found that societal severity predicted both individuals’ willingness to get vaccinated and follow Covid-19 rules, albeit only on the between-person level (Tables 6 and 7, Appendix). This indicates that participants who on average scored higher on societal severity also had a higher willingness to get vaccinated and follow Covid-19 rules. This, however, does not translate on the within-level, thereby providing an answer to RQ6 on the
within-level. More specifically, this shows that perceptions of societal severity are rather stable and do not differ daily, which is also illustrated in Figure 1. In addition, given that the difference between the coefficients of willingness to get vaccinated and follow Covid-19 rules is less than the pooled SE, their difference is not significantly different from zero. Consequently, societal severity did not more strongly predict the willingness to get vaccinated than the willingness to follow rules.

**Discussion**

Building on the EPPM and SARF, this daily diary study examined between-and within-person associations between exposure to Covid-19 information through various communication channels and emerging adults’ risk perceptions and, in turn, willingness to implement risk-inducing behaviours (i.e., follow rules, get vaccinated). Three important contributions could be made.

First, based on the SARF, our research only found that exposure to Covid-19 information in news media (i.e., television, internet, radio, newspapers) significantly predicted emerging adults’ perceived societal severity, but not personal susceptibility, while social media and interpersonal communication did not. This association was found on the within-person level, meaning that on days that a specific individual saw more Covid-19 information in news media than one would normally see on a day, one also thought that Covid-19 formed a bigger threat to society (i.e., societal severity). According to Aubrey et al. (2017), this within-person effect might be explained based on media priming effect theories. For example, when being exposed to media content, cognitions that are semantically linked to this media content become temporarily more accessible and, hence, more likely to be used in subsequent processing (Higgins et al., 1985).

The fact that exposure to news media only predicted perceived societal severity might be explained by the way Covid-19 was portrayed in the Belgian news media. In Belgium, Covid-19 was classified as a large-scale collective action problem for which all citizens needed to obey the rules to fight the coronavirus (Harring et al., 2021). This was done by using the tag line ‘1 team of 11 million’, intensively promoting key measures everyone could partake in (e.g., social distancing, mouth mask) and providing accurate Covid-19 information (e.g., numbers of infections, expert opinions on the severity of the problem) in diverse radio/television spots and magazines (Belgische-federale-overheidsdiensten, 2020). These messages did not go unnoticed as participants in our study mostly reported seeing information about vaccines and statistics in news media. As follows, in line with the impersonal impact hypothesis (Tyler & Cook, 1984) and the differential impact hypothesis (Basil & Brown, 1997), exposure to news media portraying statistics and promoting the collective effort approach (e.g., everyone must do their part, set a good example) might have more likely affected emerging adults’ cognitive risk processing and thus societal-level risk perceptions (i.e., perceptions about how much Covid-19 threatens society; El-Toukh, 2015) instead of affective processing and personal-level risk perceptions (i.e., perceptions of how likely one will get infected with Covid-19; Basil & Brown, 1997).

Second, in contrast to news media, social media coverage of, and interpersonal conversations about, Covid-19 did not impact individuals’ risk perceptions, which might be explained by the relatedness of these channels. Only exposure to Covid-19 information on
social media stimulated interpersonal communication about the topic on the between-and within-person level while news media did not. This might be explained by social media affordances (sharing, liking, commenting) that make it easier to interact with and discuss online (news) content (Hille & Bakker, 2014), especially in times of limited face-to-face interactions. Given that social media provide users with a greater diversity of information and opinions (McEwan et al., 2018), it is more likely that participants came across content that both decreased and increased perceptions of social severity and personal susceptibility, triggering communication that may have amplified as well as mitigated Covid-19 risk perceptions (Kasperson et al., 1988). Both types of communication may have outweighed each other, resulting in null associations between interpersonal communication and risk perceptions. In addition, research among college students has shown that—later on in the pandemic—social media conversations about Covid-19 no longer affect risk perceptions (Damiano & Allen Catellier, 2022), possibly because of message fatigue and decreased attention to Covid-19 information (Gardikiotis et al., 2021). This might also be an explanation for the lacking associations in our study as participants were already situated in the third lockdown. Participants might have paid less attention to what they saw on social media and/or discussed with others, possibly resulting in an absent link with risk perceptions.

However, our study did not focus in particular on social media conversations, making it impossible to make claims on the role of online vs offline interpersonal conversations. Nevertheless, given that research seems to indicate that people are more likely to express deviant opinions (e.g., trivialising the virus and holding anti-vaccine opinions) in offline than online environments (Neubaum & Krämer, 2017), future research should distinguish between face-to-face and mediated conversations and see whether these might differently predict risk perceptions. Furthermore, one should simultaneously take the content and valence of (online) interpersonal conversations into account as this might also render different risk perceptions (Li, 2021). Research, for example, already showed that the perceived valence of interpersonal communication predicted individuals’ fear of Covid-19.

A final important contribution of our study was the finding that a higher societal severity, but not personal susceptibility, increased emerging adults’ willingness to follow Covid-19 rules and get vaccinated. This aligns with the findings of Rozendaal et al. (2021) who also found perceived severity, but not susceptibility, to be an important determinant of physical distancing behaviour. It thus seems that emerging adults’ perceptions about how severe the risk is for the whole society will more likely stimulate protective behaviours than perceptions about how likely they are to contract Covid-19 themselves. This might be explained by the characteristics of our sample. That is, at the time of our study, Covid-19 mostly dangerously impacted older cohorts and people who already had certain health problems (Sciensano, 2020). As follows, our sample, consisting of 18 to 25-year-old individuals, might not have estimated the risk to get infected themselves to be very high as they did not immediately belong to the risk group. However, emerging adulthood is known for the development of relational maturity which often collides with higher levels of empathy and prosocial behaviour intended to help others (Eisenberg et al., 2005; Sze et al., 2012). Consequently, emerging adults’ willingness to engage in Covid-19-related behaviours might have more likely been driven by prosocial motives (e.g., helping others, we are all in this together) instead of personal motives as they were not directly in the high-risk group (Sciensano, 2020). This also aligns with findings from Holt et al. (2022) who found that emerging adults’ desire for collective well-being was an important factor in vaccine adherence. Our results further add to this pro-social motives hypothesis by indicating
that emerging adults’ willingness to implement Covid-19-related behaviours was rather consistent over time. Little daily variation was found within emerging adults in their willingness to implement Covid-19-related behaviours, substantiating the fact that emerging adults’ motives to comply do not vary much over days and might be driven by something on a broader level, such as the information provided on news media (i.e., the reported numbers of death and collective measurements). These are important findings as emerging adults, even though they are not a high-risk group, need to understand the gravity of the virus to play their part.

**Practical Implications**

Our findings have important implications for how different communication channels can be exploited to impact emerging adults’ health perceptions and behaviours within a crisis. First, in line with prior research (Friemel & Geber, 2021; Ranjit et al., 2021), the importance of news media should not be overlooked in future health emergencies as they appear to be frequently used by citizens to acquire accurate information, even by emerging adults who are known for their use of social media (Antunovic et al., 2018). Hence, governments should keep using television, radio and newspaper outlets to broadcast collective good appeals which might subsequently impact individuals’ perceptions of how severe the health problem is. However, building on our specific sample of emerging adults, governments should simultaneously keep in mind that not all groups might be receptive to what they see in the news media. Future research should, therefore, include more demographic and personal characteristics to examine individualistic news media preferences and, in turn, susceptibility to watching these news media (Hirsh et al., 2012; Yousef et al., 2020). This can stimulate governmental ideas on how to differently reach less susceptible or at-risk groups as well as high-risk groups. Moreover, in-depth interviews could be conducted to acquire insight into why specific governmental campaigns might not have raised awareness among certain individuals, thereby inspiring future attempts.

Second, given that societal severity played a role in implementing Covid-19 risk-inducing behaviours and personal susceptibility did not, policymakers should reflect on (1) which risk perceptions might be more relevant in resolving specific health problems and (2) how to effectively target these with communication channels. For example, while smaller and personal health problems (e.g., smoking, healthy diet) might benefit from personal-level risk perceptions which could be targeted with tailored messages (Lustria, 2018), global health problems might more likely benefit from targeting societal-level risk perceptions. This can be done by broadcasting collective-good appeals that emphasize the severity of a threat in the broader collective and, relatedly, the necessity for collective efforts. However, it should be noted that even within global health pandemics there appear to be differences as some pandemics require key measures that might not be applicable for all groups and might hence not benefit from a collective good approach. For example, pandemics such as HIV could benefit more from personalised intervention and prevention approaches (e.g., self-management tools) targeted to specific groups and subareas (Cooper et al., 2017). Each specific health problem, thus, requires a somewhat different approach. Consequently, also the results of this study should be interpreted within the Covid-19 context. Specifically, because this pandemic has been characterised by the crucial role of social media to obtain information and overcome social isolation problems (Tsao et al., 2021). As follows, social media may have played a unique role
in the Covid-19 pandemic, whereas this might not be the case for other pandemics that took place or might take place in the future.

**Limitations**

Despite the interesting results of this study, some limitations should be discussed. First, although participants’ behaviour was measured within several hours after seeing media content, we relied on self-reports which might have resulted in an over- or underestimation of what and how much they saw in the media. Second, in line with previous research (First et al., 2021; Ranjit et al., 2021; Rozendaal et al., 2021), this research separately measured the constructs of news media, social media and interpersonal communication. However, with the continuous development of new (social) media features, researchers should rethink their overall conceptualisation of communication channels as the distinction between channels is becoming more difficult. One could, for example, see a news article on the social media profile of a news provider, making it harder to classify whether this involves traditional or social media news exposure. Future research should aim to capture the overlapping possibility of channels by optimising the media measures. Third, based on the advice to keep ESM surveys as short as possible (Myin-Germeys & Kuppens, 2021), this study used single items to measure societal severity and personal susceptibility. Consequently, we cannot be entirely sure that these items served as a proxy for the intended underlying constructs. Future research should, therefore, include more extensive measures and evaluate whether the constructs actually measure personal susceptibility and societal severity. As follows, given that ambiguous results exist as to which specific risk perceptions guide the implementation of health behaviours (Karlsson et al., 2021; Magnan et al., 2021), future research should distinguish between personal/societal susceptibility and personal/societal severity to provide a comprehensive overview. Fourth, this study measured peoples’ willingness to implement health behaviours and although the prototype willingness model (Gerrard et al., 2008) suggests that this is an important predictor for the actual implementation of behaviour, we cannot assure that the results also hold when measuring actual (vaccination) behaviours. Future research should also try to measure actual behaviours. Fifth, the study’s sample consisted of 18 to 25-year-old individuals, making the results not generalisable to other demographic groups (e.g., older participants). Furthermore, this sample consisted of highly educated individuals who are more sceptical toward information provided by mainstream media compared to more scientific sources (Latkin et al., 2020; Olsen et al., 2022) and exhibit more knowledge about the virus, which makes them more resilient against misinformation online (Rattay et al., 2021). Future studies should try to recruit a more diverse sample and examine how different types of media exposure differently relate to risk perceptions and protective health behaviour among other age groups and high- versus low-educated individuals. Last, this study provides more insight into the Covid-19 situation, and the media portrayal of this situation, in Belgium. The results might not apply to other contexts that approached the Covid-19 virus differently.
Notes
2. We measured willingness to implement a risk-inducing behaviour for the following reason: During the time of the data collection, not all people had the possibility to get vaccinated as the vaccination campaign was still starting up. As follows, to avoid exclusion, we decided to measure individuals’ willingness to engage in behaviour as this, according to the prototype willingness model, appears to play an important role in the actual implementation of a behaviour.
3. The daily surveys also entailed additional items on top of our variables of interest. However, given that they are not used in the current study, they will not be discussed further.
4. We also tested the models’ assumptions. More information on this can be found in the Appendix.

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Conflict of Interest
No potential conflict of interest was reported by the author(s).

References


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