Responses to Social Media Influencers' Misinformation About COVID-19: A Pre-Registered Multiple-Exposure Experiment

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Abstract

In the current 'infodemic', surrounding the spread of false claims as well as conspiracy theories related to COVID-19, social media influencers, popular figures on platforms like Instagram, are a potential source of misinformation. As seemingly ordinary and trustworthy individuals, who can function as opinion leaders, influencers may impact perceptions of the virus and policies in place to minimize its threat. In this pre-registered online experiment ($N = 148$), we investigated factors such as parasocial relationships with the influencer, which potentially increase susceptibility to influencers' claims. Second, we examined if media literacy and issue-specific knowledge act as protective factors diminishing the impact of misinformation. Although participants remained largely unaffected by the misinformation, it increased mistrust in official sources for respondents with high perceived influencer credibility, trust in influencer's advice, and attitude homophily. Meanwhile, participants' issue-specific knowledge was associated with weaker beliefs in misconceptions regarding COVID-19, irrespective of exposure to misinformation.

Keywords: misinformation, influencers, COVID-19, media literacy, differential susceptibility, infodemic

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The COVID-19 pandemic has been accompanied by a so-called infodemic, defined by the World Health Organization (2020) as "an overabundance of information" that "includes deliberate attempts to disseminate wrong information to undermine the public health response and advance alternative agendas." In this specific context, false or misleading information about the virus, preventive measures and vaccines have been spread (Buchanan, 2020), which may fuel uncertainty and confusion among citizens. Against this background, governments have used the reach and impact of social media influencers, who are ostensibly down-to-earth celebrities on platforms like Instagram, to counter the circulation of misinformation and educate the public about SARS-CoV-2 (Abidin et al., 2021). However, at the same time, influencers have themselves been identified as producers of misinformation (Maloy & De Vynck, 2021).

While several studies have investigated effects of and susceptibility to misinformation (e.g., Gerosa et al., 2021; Roozenbeek et al., 2020), particularly in the context of the pandemic, influencers as sources of false or unfounded claims have mostly been neglected. Moreover, the existing literature has used the term influencer for different types of personalities including traditional celebrities who are active on social media (e.g., Abidin et al., 2021). Yet, it is important to differentiate social media influencers from traditional celebrities, who are known for a certain profession and/or whose success is mainly conferred by mainstream media (Khamis et al., 2017). In contrast, influencers can be described as 'democratized celebrities' (Hearn & Schoenhoff, 2016)—that is, regular people who became well-known on social media due to their efficient self-presentation on these platforms. Their prominence on social media allows them to promote products (Ferchaud et al., 2018), but also convey their opinions about 'serious' topics, e.g., health or politics, to their audiences (Newman et al., 2021).[1] Followers

have been found to identify more easily with influencers and find them more credible than traditional celebrities like musicians or athletes (Schouten et al., 2020), which is often explained by perceptions of influencers' relatability, ordinariness and authenticity (Berryman & Kavka, 2017; Ferchaud et al., 2018).

Given the lack of research on influencers' misinformation in general and on COVID-19 in particular, we identify four important research gaps: First, there is a need for exploring whether influencers' misinformation about COVID-19 raises thematic misbeliefs as well as mistrust in official information among their audiences. Second, while young adults generally place faith in and develop intimate bonds with these online opinion leaders (Schouten et al., 2020), the precise factors which make them vulnerable to influencers' misinformation are understudied—yet, are indispensable for both academics and practitioners designing intervention programs. Third, research still requires solution-oriented approaches to combat misinformation at the level of the individual, since platform-based measures aimed at mitigating misinformation are non-exhaustive (Bastick, 2021). Factors like media literacy and issue-specific knowledge may be helpful in averting harmful effects of misinformation on young people but remain understudied. Fourth, we identify a methodological shortcoming in the existing experimental research, which uses either single exposure to fictitious influencers' content (e.g., De Veirman et al., 2017) or real influencers' content (e.g., Boerman & van Reijmersdal, 2020; Janssen et al., 2021). Although providing a crucial contribution to our existing knowledge, both approaches have shortcomings: single exposure to fictitious influencers does not provide participants with cues about the influencers' regular content, thematic focus, or communication style. Meanwhile, using existing influencers poses the risk of differential familiarity with the influencer among participants, which is especially problematic in the context of misinformation. Thus, novel experimental designs using multiple exposure points, while simultaneously ensuring high internal validity, are warranted.

Accordingly, we investigated whether exposure to an influencer's misinformation about COVID-19 on Instagram compared to factual information by the same source fosters misconceptions about the virus as well as mistrust in information provided by official sources. Additionally, we explored, for the first time, potential susceptibility and preventive factors that may accelerate or hinder these effects. To that aim, we used a pre-registered multiple-exposure online experiment with a fictitious influencer. This approach rules out prior familiarity with this influencer, while accounting for the fact that in real-world environments individuals are exposed to influencers' content time and again.

Influencers as a Source of Misinformation

In modern democratic societies, sources of information have diversified, with traditional news media experiencing competition from social networks and its avid users (Hearn & Schoenhoff, 2016). The consequent growth in quantity of information has also given rise to misinformation, which is defined as "a claim that contradicts or distorts common understandings of verifiable facts" (Guess & Lyons, 2020, p. 10). Misinformation has detrimental consequences for democracies, as it results in "a worse informed populace" (Levy, 2017, p. 20). In health crises, such as pandemics, adherence "to unofficial medical advice" has potentially dangerous consequences for individuals as well as society (Swire-Thompson & Lazer, 2020, p. 440). Individuals who share false or misleading content may be unaware that it deviates from the truth. Misinformation is therefore not defined by the intent to construct or reinforce misbeliefs surrounding a given topic and cause harm, which distinguishes it from 'disinformation' (Guess & Lyons, 2020).

A central locus of misinformation is social media, where users are generally more likely to be exposed to misinformation than individuals who turn to traditional media for news (Roozenbeek et al., 2020). On social media, incorrect information can be easily distributed among friends, family and introduced into the public sphere. Especially when

misinformation resonates with the views of like-minded others, it gains viral qualities (Törnberg, 2018, p. 16). Furthermore, in today's high-choice media environment, content which is sensationalist and evokes strong emotions—qualities inherent to misinformation (Vosoughi et al., 2018)—is in the spotlight.

The proliferation of misinformation is also dependent on the actors who promote it (e.g., Shin et al., 2018). Influencers may be a driver of the spread of misinformation. On TikTok or Instagram, they are one of the most popular news providers among young adults (Newman et al., 2021). However, given their lack of expertise for certain topics (e.g., nutrition; Reinikainen et al., 2020), they can, in theory, expose a large audience to false information. In fact, some scholars argue that influencers act as endorsers of misinformation (see e.g., Mena et al., 2020 for Instagram personalities), while others conclude that influencers can both propel and diminish the spread and effects of misinformation (Abidin et al., 2021). In any case, whether their involvement is harmful or helpful, influencers can have a significant impact on followers' attitudes, which has led researchers to categorize them as modern-day opinion leaders (e.g., Casaló et al., 2020).

Opinion leaders are defined as individuals in groups who give advice on topics on which they are better informed than their counterparts (Katz & Lazarsfeld, 1955/2006). Although influencers do not act as opinion leaders in face-to-face interaction, their communication to followers is rendered seemingly interpersonal (Ferchaud et al., 2018), which is captured by Stehr and colleagues (2015) as 'parasocial' opinion leadership. While opinion leadership traditionally takes place in small groups of individuals (Katz & Lazarsfeld, 1955/2006), influencers' opinions become accessible to large numbers of people. Influencers' opinion leadership is further augmented by their high levels of self-disclosure (Ferchaud et al., 2018), as well as their perceived ordinariness and authenticity (Berryman & Kavka, 2017; Reinikainen et al., 2020). As recipients experience influencers' struggle for

fame and are immersed in influencers' everyday life, influencers' advice on, e.g., health issues may seem more personal and sincere (Zimmermann et al., 2020). Especially in times of uncertainty (e.g., during a pandemic), young people may become susceptible to influencers' (mis-)information, when they look to them for advice (Gleason et al., 2017). In the context of influencers' misinformation, followers may adopt sentiments and arguments which are not based on scientific evidence.

Accordingly, the quality of information from opinion leaders that people subject themselves to may determine the trajectory of their decisions, behaviors, and attitudes. Views expressed in misinformation may manifest themselves among recipients and influence their beliefs. Recent research has found that even small pieces of false or unfounded information can have a bearing on attitudes (Bastick, 2021). In the context of the pandemic, misinformation may result in ignorance of policies and rules in place to diminish the spread of the virus. It may foster misbeliefs and wrongly held conceptions about COVID-19 (Gerosa et al., 2021), especially when false claims are spread by potential opinion leaders (Weeks & Gil de Zúñiga, 2021).

In this study, misinformation that is distributed by influencers may negatively impact followers' risk perception of the virus. Moreover, we postulate that some of the themes recurrent in misinformation about COVID-19 will shape people's attitudes toward these measures when communicated by influencers. Here, we focus on two specific claims that are likely to be communicated by influencers, as their content often revolves around lifestyle-oriented and health-related topics (Reinikainen et al., 2020)—that is, the supposed ineffectiveness of face masks (Ashford, 2021) and maintaining a healthy lifestyle to completely prevent infection with the virus (Caldera, 2020). We expect that when being exposed to these false claims, respondents will not only follow suit and change their attitudes in accordance with the misinformation, but also perceive less threat from COVID-19 overall.

In contrast, young people who see correct or neutral information by influencers, that is not at odds with official information, will expectedly have little doubt in the fact that COVID-19 is hazardous and believe in the protective measures communicated by authorities. Therefore, we anticipate that misbeliefs related to COVID-19 will be more frequent among those young people who are exposed to influencers' misinformation than those subjected to factual information by influencers. Correspondingly, our first set of hypotheses[2] states:

H1: Compared to individuals who were exposed to correct information by influencers, individuals exposed to misinformation by influencers will be more likely to a) have a negative attitude toward wearing face masks, b) think that a healthy lifestyle can completely prevent infection with COVID-19 and c) believe that COVID-19 is not a serious disease.

We additionally hypothesize that belief in influencers' misinformation is closely associated with low faith in information provided by official sources. False and misleading claims are mainly made by alternative sources and contrast mainstream narratives (Shin et al., 2018). Accordingly, individuals with lower trust in traditional news media, have been found to be more inclined to believe misinformation (Zimmermann & Kohring, 2020) and to abandon journalistic information (Lazer et al., 2018). Influencers can be consulted complementary to traditional media or as an alternative (Newman et al., 2021), considering they offer more practical and opinion-oriented advice (Zimmermann et al., 2020). When consequently exposed to influencers' misinformation, the gap between young people's perception of this alternative source and their attitude toward institutions may widen. This outcome may be explained by cognitive dissonance, which renders trust in 'elite' actors incompatible with believing in the non-mainstream narrative propagated by the influencers (Anspach & Carlson, 2020). However, mistrust in official sources would likely not be raised, if influencers' communication was in line with official information (i.e., if influencers did not fuel skepticism toward COVID-19-related measures). Therefore, specifically by sharing false

or misleading claims, influencers may increase mistrust in official sources. Hence, we hypothesize:

H2: Compared to individuals who were exposed to correct information by influencers, individuals exposed to misinformation by influencers will have less trust in official information.

Influencers' Misinformation: Susceptibility Factors

Influencers' misinformation may not affect all followers alike. The Differential Susceptibility to Media Effects Model (DSMM, Valkenburg & Peter, 2013) suggests that individual differences determine exposure to and effects of media content. For instance, some followers may turn to influencers and pay close attention to their advice, because they regard them as idols (Gleason et al., 2017). The search for role models is especially prevalent in adolescence, which is defined by ongoing identity formation (Gleason et al., 2017). Regardless of their life stage, followers may also be predisposed to be subjected to and affected by influencers' communication due to a tendency to feel similar to them (Schouten et al., 2020), or because of high degrees of trust in their advice (Reinikainen et al., 2020). As these factors are preexisting attitudes or emotions that leave followers vulnerable to influencers' content, they can be ranked among dispositional susceptibility (Valkenburg & Peter, 2013). These dispositional susceptibility factors can both act as predictors of media use and as moderators of media effects (Valkenburg & Peter, 2013). In the context of exposure to influencers' misinformation, we focus on the moderating role of these factors, as they may determine whether individuals fall victim to the misinformation.

Previous research has especially emphasized the role of parasocial relationships in determining influencers' persuasiveness. These are bonds maintained with media personalities based on parasocial interaction, which can be defined as the illusion of reciprocal exchange with them (Horton & Wohl, 1956). By way of sharing aspects of their

personal lives with their fans, directly addressing their followers and keeping them constantly updated through social media (Berryman & Kavka, 2017; Ferchaud et al., 2018), influencers provide fertile ground for the development of parasocial relationships. Prior research in marketing (e.g., Lee & Watkins 2016; Lou & Kim, 2019) and health communication (Phua et al., 2018) suggests that parasocial relationships facilitate influencers' persuasive impact. Specifically, high parasocial relationship intensity has been found to decrease the likelihood of identifying the persuasive intent of influencers (Boerman & van Reijmersdal 2020) and increase compliance intention with influencers' health-related advice (Phua et al., 2018). Drawing from these findings, we expect that parasocial relationships moderate the effect of misinformation on COVID-19-related misbeliefs as well as mistrust in institutions and official information.

H3a: The effects hypothesized in H1-H2 are stronger for individuals with greater parasocial relationship intensity with the influencer.

As noted previously, misinformation thrives when people who are exposed to it agree with the viewpoints expressed in the content (Törnberg, 2018). They are more likely to consume as well as share misinformation in networks of like-minded individuals (Guess & Lyons, 2020). Accordingly, the spread of misinformation is closely linked to "homogeneous clusters," in which opinions are consonant (Guess & Lyons, 2020, p. 21). Similarly, as people are more likely to interact with similar others, partisan homophily has been found to accelerate the spread of misinformation (Rojecki & Meraz, 2016). This notion is summarized under the generic term attitude homophily, which is defined as "the degree to which people who interact are similar" in characteristics such as beliefs, education, or social status (Eyal & Rubin, 2003, p. 80).[3] Existing research on purchase intentions (Lou & Kim, 2019) or product attitude (Kim & Kim, 2021) suggest that attitude homophily determines stronger susceptibility to influencers' communication. Extrapolated to the context of our study, we

expect misinformation to have a stronger impact on COVID-19-related attitudes and mistrust in official sources among individuals who perceive the influencers' attitudes to be like their own (i.e., are high in attitude homophily). Thus, we hypothesize:

H3b: The effects hypothesized in H1-H2 are stronger for individuals with higher perceived attitude homophily.

The role of influencer credibility in determining the efficacy of influencers' health-related messages has not yet been explored, but findings in marketing research indicate that trust in influencers is linked to effects of their content on followers' purchasing behavior (e.g., Lou & Kim, 2019; Kim & Kim, 2021). Besides functioning as trusted sources of information in their areas of interest, influencers act as advice-givers on specific topics, which links with theory surrounding domain-specific opinion leadership that separates individuals with a perceived issue-specific expertise from general influentials (Gnambs & Batinic, 2012). We therefore expect that reliance on influencers—both as an issue-specific source of information and role model—play a crucial role in determining the effects of misinformation provided by them. In the context of misinformation, we assume that trust in the influencer's COVID-19-related advice as well as their perceived credibility when communicating about the issue of COVID-19 moderate the effects of false or unfounded claims made by influencers on COVID-19-related misbeliefs and institutional mistrust.

H3c: The effects hypothesized in H1-H2 are stronger for individuals with higher trust in the influencer's issue-specific advice.

H3d: The effects hypothesized in H1-H2 are stronger for individuals with higher perceived influencer credibility.

Influencers' Misinformation: Preventive Factors

Drawing from the *Differential Susceptibility to Media Effects Model* (Valkenburg & Peter, 2013), individuals' predispositions may not only make individuals more vulnerable to

influencers' misinformation, but also protect them from it. One of the most frequently discussed factors that may help individuals detect mediated misinformation is media literacy (e.g., Jones-Jang et al., 2021; Lazer et al., 2018). Across different genres, there is consensus that media literacy can be considered the specific knowledge and skills that help critical understanding of media information and usage of a medium (e.g., Ashley et al., 2013, 2017; Festl, 2021; Jones-Jang et al., 2021). Extrapolated to influencers' misinformation, individuals' competencies may help them resist or critically evaluate the information influencers provide about COVID-19. Previous research has revealed that media literacy equips individuals with the ability to navigate and critically evaluate the high amount of information online (e.g., Ashley et al., 2013) and makes them more skeptical of the quality of information on social media overall (Ashley et al., 2017). Since influencers communicate via social media platforms, social media literacy, which "requires decoding, evaluating, and communicating, while equally grasping the broader digital media and social affordances" (Festl, 2021, p. 251), may increase individuals' critical evaluation of information on social media platforms, including influencers' misinformation. Thus, we expect:

H4a: The effects hypothesized in H1-H2 are weaker for individuals with higher social media literacy.

Another factor that has received ample attention as a protective factor from misbeliefs about COVID-19 is individuals' issue-specific knowledge (Austin et al., 2021; Lep et al., 2020; Rieger & He-Ulbricht, 2020; Zhong et al., 2020). Objective issue-specific knowledge that is assessed with knowledge tests has been found to be associated with a lower likelihood of negative attitudes toward COVID-19 and measures to prevent infection (Zhong et al., 2020) as well as with higher expectancies that COVID-19-related measures are effective (Austin et al., 2021). Furthermore, researchers showed self-reported subjective knowledge about COVID-19 to be related to higher credibility of news provided by medical

professionals and scientists (Lep et al., 2020) and higher trust in the government's pandemic-related recommendations (Freimuth et al., 2014). Applied to the context of influencers' misinformation, it can therefore be assumed that in addition to social media literacy, objective and subjective COVID-19-related knowledge prevents individuals from being persuaded by influencers' misinformation. Hence, our last hypothesis states:

H4: The effects hypothesized in H1-H2 are weaker for individuals with higher b) objective, and c) subjective COVID-19-related knowledge.[4]

Figure 1 shows an overview of our hypothesized model.

Method

We conducted a pre-registered between-subjects experiment with a longitudinal design in March/April 2021 across five different time points (T1-T5) in Belgium.[5] Inclusion criteria were active Instagram use (i.e., to ensure familiarity with influencers as sources of information on this platform), female gender, and age between 18 and 30 years. We chose these inclusion criteria to match age and gender of the fictitious lifestyle Instagram influencer in our study (see stimulus material). Lifestyle and health influencers on Instagram tend to be female (Abidin, 2016; Janssen et al., 2021) and the perception of similarity can be determined by the congruency between influencers' and followers' age and gender (Eyal & Rubin, 2003). Additionally, female users tend to be more susceptible to influencers' communication on Instagram (De Veirman et al, 2017). Furthermore, the sample of 18- to 30-year-olds roughly corresponds with the age group that relies most on influencers for news on Instagram (Newman et al., 2021). The study was approved by the ethical internal review board of KU Leuven (G-2021-2976). Each participant received a 5-Euro gift voucher as an incentive for participation. Only participants who actively consented to the participation were included in the study. We informed participants that the research's goal was to investigate responses to social media influencers in daily life and that they could stop their participation at any point.

Participants were also extensively debriefed including a correction of the misinformation as well as a detailed explanation of the COVID-19 measures in place at the time of the study.

Sample

We recruited participants via social media using the snowball sampling technique.[6] We conducted an a-priori power analysis (for a two-tailed t-test) using G*power to determine the sample size for our study (1 - β = .80; α = .05) for detecting a medium effect size of d = .50, which resulted in a total sample size of N = 128. In total, N = 148 female participants took part in the study. Of these, five participants were excluded due to lack of congruence with the inclusion criteria or invalid responses. On average, participants were 22.87 (SD = 2.48) years old, with 23.6% indicating a high school degree, 32.4% higher education outside of university, and 43.2% a university degree.[7]

Procedure

At T1 (N = 148), we assessed participants' socio-demography and the hypothesized protective factors. Participants had one week time to complete the pre-questionnaire at T1. Once sufficient participants took part at T1, all participants received four questionnaires spread across four time points (T2–T5) during one week with 48 hours between each time point. Thus, the total field time was two weeks. At T2, T3 and T4, participants were exposed to lifestyle-related posts by a fictitious influencer over the course of one week for the purpose of familiarization with the influencer and her content. At T5, we assigned the remaining subjects (N = 118) randomly to a treatment group (n = 66), which was twice exposed to misinformation related to COVID-19, and a control group (n = 52), which was presented neutral posts not including misinformation. To ensure that all participants completed the questionnaires in the same time frame, the link to the questionnaire expired after 48 hours.

Stimulus Material

We exposed participants to the content of a fictitious female influencer on Instagram (see Appendix C). We created the profile based on genuine female lifestyle influencers who disseminated misleading information about COVID-19 in Belgium. We chose a female fictitious influencer in her mid/late twenties[8], who had more than 100,000 followers and was interested in yoga and healthy eating, as lifestyle influencers often share experiences of their conscious lifestyle with followers (Reinikainen et al., 2020). The language of the posts and the survey was Dutch and the posts were presented as screenshots from an Instagram profile. At T2 to T4, participants were exposed to four lifestyle posts not containing any misinformation to familiarize participants with the influencer and her content. At T5, the treatment group was exposed to two misinformation posts which were used in a similar way by real influencers in Belgium, and one additional lifestyle post as a filler post. In the first misinformation post, the influencer emphasizes the inefficacy of wearing face masks, which was a common claim about COVID-19 on social media platforms (e.g., Ayers et al., 2021). In the second post, the influencer stresses that exercising and maintaining a healthy lifestyle is the best way to combat COVID-19 and can completely prevent infection with the virus. This claim used by lifestyle influencers in Belgium and around the world has been declared as false information by the fact-checking organization Politifact (Kertscher, 2021). The control group was exposed to neutral posts not containing any misinformation about COVID-19. All other message characteristics (i.e., images, comments, likes, and emoticons) were held constant across both groups (see Appendix A).

Measures

If not stated otherwise, we measured all items on a 5-point Likert scale. Appendix A (Table A1) presents zero-order correlations and Appendix D displays full item wordings.[9] In line with Nunnally (1978), we used a Cronbach's alpha level of $\alpha = .70$ as a cutoff criterion to determine internal consistency of our measurement instruments. We used two items (e.g.,

"Wearing a face mask has harmful side effects that are worse than a COVID-19 infection") from Rieger and He-Ulbricht (2020) to assess negative attitude toward wearing a face mask ($M = 1.77$, $SD = 0.82$, $r = .43^{***}$).[10] Agreement with the belief that a healthy lifestyle can completely prevent oneself and others from infection with COVID-19 was assessed with two self-formulated items (e.g., "A healthy lifestyle (e.g., sports, healthy nutrition) can completely prevent someone from being infected with COVID-19"; $M = 1.86$, $SD = 1.13$, $r = .52^{***}$). Based on Sherman and colleagues (2020), we used three items to measure low risk perception of COVID-19 (e.g., "I do not think that COVID-19 is a dangerous disease"; $M = 1.69$, $SD = 0.77$, $\alpha = .73$). We gauged mistrust in official information ($M = 2.03$, $SD = 0.75$, $\alpha = .79$) with five statements (e.g., "The media in general tries to hide information about COVID-19 from the public") based on Rieger and He-Ulbricht (2020).

Parasocial relationships was measured on an eight-item scale (e.g., "I see her as a natural, down-to-earth person"; $M = 2.08$, $SD = 0.73$, $\alpha = .89$), which was based on Rubin and colleagues (1985) but adapted to the influencer context. We assessed attitude homophily using five items (e.g., "This influencer thinks like me"; $M = 1.90$, $SD = 0.77$, $\alpha = .90$), based on Lee and Watkins (2016). We measured trust in the influencer's issue-specific advice by using three items (e.g., "She is a role model for me in dealing with COVID-19"; $M = 1.70$, $SD = 0.88$, $\alpha = .87$) based on Casaló and colleagues (2011) and perceived credibility of the influencer on a 7-point Likert scale with five items (e.g., "She seemed unreliable/reliable"; $M = 3.29$, $SD = 1.37$, $\alpha = .88$) based on Ohanian (1990).

To assess objective knowledge about COVID-19, participants were presented with true or false-statements and asked to rate their veracity (e.g., "The coronavirus is a new form of the influenza virus"). Each correct answer resulted in a point on a summative scale ranging from 0 to 9 ($M = 7.56$, $SD = 1.04$). To measure subjective knowledge about COVID-19 ($M = 3.71$, $SD = 0.81$, $\alpha = .79$), we used three items (e.g., "I think I know the symptoms and course

of the disease COVID-19") based on Lep and colleagues (2020). Last, we assessed social media literacy with two items (e.g., "I know all the settings and features on Instagram"; M = 2.45, SD = 0.90, r = .46***) based on Festl (2021).[11]

Manipulation Check

At the end of the survey, we asked respondents to rate the following statements: "mirabellemartin_ indicated that face masks do not protect from the spread of COVID-19" and "mirabellemartin_ indicated that exercise can prevent from being infected with COVID-19". As expected, the treatment group (M = 3.89, SD = 1.45) indicated to a higher degree that the influencer had expressed a negative attitude toward face masks than the control group (M = 1.44, SD = 0.94, t(112.12) = -11.11, p < .001). Similarly, participants in the treatment group were more likely to state that the influencer claimed a healthy lifestyle to be a preventive measure (M = 3.67, SD = 1.47) than the control group (M = 1.81, SD = 0.97, t(112.80) = -8.24, p < .001).

Data Analysis

To test H1 to H2, we first performed ANCOVA in SPSS (Version 27) to investigate whether risk perceptions of COVID-19, COVID-19-related measures, and mistrust in official information were different between the control and the treatment group. Second, we used moderation analysis with the Johnson-Neyman technique in PROCESS (Hayes, 2017) to test H3 and H4. We used the *interactions* package in R (Long, 2021) to plot the interaction effects. All predictors were mean-centered before creating interaction terms. We included age as a covariate in all analyses, considering participants were significantly older in the treatment group than in the control group (see Appendix B for randomization checks).

Results

First, ANCOVA revealed that participants in the misinformation group did not show significantly more negative attitudes toward face masks (M = 1.70, SD = 0.79) than subjects

in the control group (M = 1.85, SD = 0.87), $F(1, 115) = 1.40$, $p = .24$, *partial* $\eta^2 = .012$. Therefore, H1a was not confirmed. Similarly, participants in the misinformation group did not believe to a higher degree that a healthy lifestyle can completely prevent infecting oneself or others with the virus (M = 1.90, SD = 1.08) than people in the control group (M = 1.81, SD = 1.19), $F(1, 115) = 0.15$, $p = .70$, *partial* $\eta^2 = .001$. H1b was therefore also not supported.

Furthermore, perceived low COVID-19 risk perceptions did not differ significantly between the treatment (M = 1.64, SD = .70) and the control group (M = 1.76, SD = 0.85), $F(1, 115) = 0.64$, $p = .43$, *partial* $\eta^2 = .006$. Thus, H1c could not be confirmed. H2 was also rejected: Participants in the misinformation group did not show higher levels of mistrust in official information (M = 2.00, SD = 0.74) than participants in the control group (M = 2.07, SD = 0.77), $F(1, 115) = 0.89$, $p = .35$, *partial* $\eta^2 = .008$. In summary, results showed no overall significant differences in risk perceptions of COVID-19, COVID-19-related measures, and mistrust in official information between groups (Table 1).

Susceptibility Factors

Results revealed that parasocial relationships did not moderate any of the effects proposed in H1-H2 (see Appendix A: Table A2). Thus, H3a had to be rejected. However, moderation analyses using the Johnson-Neyman technique (Figure 4 and Figure 5) revealed that at medium to high levels of trust in the influencer's COVID-19-related advice (b = 0.93, SE = 0.28, p = .001, significant above 2.30), and high levels of influencer's credibility (b = 0.52, SE = 0.13, $p < .001$, significant above 4.25), subjects exposed to misinformation reported significantly greater mistrust in official information about the virus than the control group (Tables A4 and Table A5). In contrast, at low levels of trust in the influencer's COVID-19-related advice (significant below 1.24) and medium to low levels of influencer's credibility (significant below 2.69), the treatment group was less suspicious of official information than the control group. Furthermore, at high levels of attitude homophily the

treatment group reported significantly higher mistrust than the control group (b = 0.42, SE = 0.19, p = .034, significant above 4.0). Yet, none of the participants in our sample indicated such high levels of attitude homophily (Figure 2, Table A3). Concerning the moderations of the effect of misinformation on mistrust, H3b, H3c and H3d could thus be partly confirmed. Furthermore, at low levels of trust in the influencer's COVID-19-related advice (b = 0.69, SE = 0.29, p = .019, significant below 1.35), the treatment group was even more convinced that the virus was a threat, thus showed resistance to the misinformation (Figure 3, Table A4).

Furthermore, we found main effects of two of the assumed susceptibility factors on COVID-19-related attitudes. Parasocial relationship intensity was linked with greater conviction that maintaining a healthy lifestyle is a sufficient measure to protect from infection with the virus, irrespective of exposure to misinformation (b = 0.38, SE = 0.16, p = .017, Table A2). Attitude homophily was also positively associated with the belief that a healthy lifestyle can prevent infection with Sars-CoV-2 (b = 0.21, SE = 0.10, p = .033) and moreover impacted mistrust in official information (b = 0.32, SE = 0.15, p = .037, Table A3).

Preventive Factors

We found that social media literacy neither moderated any of the effects proposed in H1-H2, nor were there any main effects of social media literacy on the outcomes (Table A6). Thus, H4a could not be confirmed. Objective and subjective COVID-19-related knowledge also did not emerge as a moderating factor (Table A7 and Table A8). Thus, H4b and H4c had to be rejected. However, knowledge was overall associated with less misbeliefs regarding COVID-19 across both groups: The belief that a healthy lifestyle is a sufficient preventive measure was negatively related with objective (b = -0.21, SE = 0.10, p = .036) and subjective knowledge (b = -0.34, SE = 0.13, p = .009). Similarly, higher objective (b = -0.17, SE = 0.07, p = .012) and subjective knowledge (b = -0.20, SE = 0.09, p = .029) were negatively related with the belief that COVID-19 is not a serious threat (i.e., low risk perceptions). In addition,

objective knowledge was positively related with an affirmative attitude toward face masks (b = -0.19, SE = 0.07, p = .008), while subjective knowledge was associated with less mistrust in official sources (b = -0.23, SE = 0.09, p = .009).

Discussion

This study set out to investigate whether misinformation compared to correct information about COVID-19 provided by social media influencers as digital opinion leaders affects attitudes toward COVID-19 as well as their mistrust in official information. Using a pre-registered multiple-exposure experiment, we found that misinformation provided by a lifestyle influencer did not universally foster misconceptions regarding the virus among recipients. However, in line with the theoretical approach of the DSMM (Valkenburg & Peter, 2013), we identified, for the first time, novel factors that defined individuals' susceptibility to influencers' misinformation[12]. More specifically, we shed light on determinants that may foster mistrust in official information about the pandemic provided by the government or the media after exposure to influencers' misinformation about COVID-19.

First and foremost, it is important to note that most of our hypotheses did not receive support, although we theorized and included a high number of individual susceptibility factors. Yet, reporting null findings represents a crucial contribution that reduces the issues of publication bias and inflated effect sizes (Dienlin et al., 2021). As such, our findings suggest that misinformation by influencers may generally not elevate COVID-19-related misbeliefs or mistrust in institutions and official information among youth. Even though the influencer explicitly emphasized the ineffectiveness of face masks and the effectiveness of a healthy lifestyle to prevent infection from the virus, these attitudes were not more prominent among participants who were shown the respective misinformation than among those who saw neutral information by the influencer. The opinion leadership that is commonly ascribed to influencers may thus be less powerful when they use misinformative claims, than in settings

in which an attitude change may be easier to achieve (e.g., when promoting products; Casaló et al., 2020). Although it cannot be entirely ruled out that the null findings may be partly explained by factors such as the statistical power that only allowed detecting medium to large effects or the relatively high objective issue-specific knowledge in this sample, the findings still raise confidence in youth's skills to detect misleading information.

Nevertheless, our findings show in line with existing research (e.g., Pennycook & Rand, 2020) that misinformation can raise misbeliefs among youth under certain conditions. We found that misinformation predicted higher mistrust in official information with higher levels of attitude homophily. Perceived attitudinal resemblance with influencers who share alternative, albeit scientifically uncorroborated takes on a topic may raise suspicion of information provided by official—that is, governmental or journalistic—sources. This argument aligns with previous research that has noted the power of fake news and source homophily to reduce trust in expert opinions (Hakobyan & Koulovatianos, 2019).

Similarly, our findings showed that perceived issue-specific credibility of influencers and trust in their thematic advice moderated the effects of influencers' misinformation on mistrust in official information. This result is largely in line with literature suggesting that individuals who turn to and rely on alternative news sources may be skeptical of official information (e.g., Jackob, 2010). In the present study, we show that trust in the influencer as a source that is perceived as similar and reliable amplifies institutional mistrust after exposure to misinformation. As a result of being subjected to influencers' misinformation and trusting this source's advice, young people may need to dispute the legitimacy of omnipresent mainstream perspectives on COVID-19 to avoid cognitive dissonance (Anspach & Carlson, 2020). In contrast, participants who did not believe that the influencer was credible or to be trusted as an advisor on COVID-19 had even greater confidence in official sources, which points to a polarizing effect of the misinformation. Moreover, trust in the influencer's

COVID-19-related-advice was the only factor which moderated the effect of misinformation on risk perception of the virus, which implies that when the views of an influencer are not deemed exemplary, misinformation that downplays the risks associated with the virus will lead people to be strengthened in their belief that COVID-19 is a serious threat.

Although identified repeatedly as a facilitator of influencers' persuasive effects in marketing research (Lee and Watkins 2016; Lou & Kim, 2019), parasocial relationship intensity did not moderate the effect of misinformation on COVID-19-related misconceptions. Thus, our findings contradict previous research suggesting that health-related compliance with influencers' advice increases with higher parasocial relationship strength (Phua et al., 2018). It is possible that the strength of parasocial relationships needs to be stronger for compliance with misinformation compared with regular health-related advice. Building a sufficiently strong parasocial relationship with the influencer may also require more time, as these bonds have been found to develop only after repeated instances of parasocial interaction (Dibble et al., 2016).

While parasocial relationship intensity had no moderating effect, it was overall positively related with the belief that a healthy lifestyle can prevent infection with the virus. This result may be explained by the thematic focus of the influencer on lifestyle topics to which both groups of participants were exposed to before the experimental manipulation. Some of these posts were related to nutrition, which is why participants who experienced greater parasocial relationship intensity with the influencer might have come to not only suppose the general benefits of a healthy lifestyle (Hoffner & Bond, 2022), but also its preventive effects on risk of viral infection.

Among the preventive factors, we did not find social media literacy to be a moderator of influencer's misinformation on COVID-19-related misconceptions, which contradicts studies investigating literacy and online misinformation (Kahne & Bowyer, 2017) as well as

conspiracy theories (Ashley et al., 2017). Yet, the finding is in line with previous research, which does not find preventive effects of media literacy and deems other forms of literacy related to information systems and technical aspects as more effective in protecting from misinformation (Jones-Jang et al., 2021).

Furthermore, although we did not find that subjective or objective issue-specific knowledge protected individuals from influencer's misinformation, the results revealed that prior knowledge about an issue was overall related to lower beliefs in false claims—irrespective of whether individuals were exposed to the influencer's misinformation. Although this finding is merely correlational, it corresponds with previous results, which emphasized that negative attitudes toward COVID-19-related measures were mostly held by those who displayed issue-specific knowledge deficiency (Zhong et al., 2020). Regarding subjective knowledge, we found that people who thought they were knowledgeable about COVID-19 were less likely to have misconceptions about COVID-19 and mistrust in official information, which may be attributed to perceived competent official communication about the virus (Freimuth et al., 2014). Taken together, although COVID-19-related knowledge is related to less misconceptions about the virus, factors that may protect from influencer's misinformation could not be identified in this study and warrant further research attention.

Limitations and Future Research

This study has some notable limitations. We only exposed participants to two specific misinformation messages that may not reflect the wide range of false or misleading claims related to COVID-19 used by influencers in the pandemic (Abidin et al., 2021). Yet, the claims we used were based on real messages disseminated by Belgian influencers and have also been found to be widespread in other countries (Ayers et al., 2021; Kertscher, 2021). Furthermore, due to the multiple exposure design, which caused sample attrition, our final sample size at T5 was slightly below the one suggested by the a-priori power analysis

necessary to detect a medium effect size. Therefore, we were not able to detect small-to-medium effect sizes, which may also explain some of the null findings. Hence, replications with a larger sample size are warranted to account for smaller effects, although these might be overall less meaningful outside the experimental context.

It is also noteworthy that we used a snowball sample in this study, which may have resulted in a sample that was overall rather well-informed on COVID-19. However, randomization checks suggested no significant differences in objective issue-specific knowledge or other relevant variables between groups (see Appendix B). Additionally, our sample consisted of young female Instagram users and was therefore not representative for all audiences of influencers. However, "social media influencer labor" (Hopkins, 2019, p. 4702) and followers of lifestyle influencers have been found to be predominantly female (see Abidin, 2016 for an overview; Janssen et al., 2021). Nevertheless, examining whether the influencer's or follower's gender, along with the influencer's thematic focus (e.g., lifestyle, fashion, entertainment) or other content characteristics (e.g., the number of likes), further affect susceptibility to misinformation provides important avenues for future research.

Furthermore, our approach of using a fictitious influencer to avoid differential previous familiarity with the influencer increased the internal validity of our study but permitted less opportunities for building a parasocial relationship or developing attitude homophily with the influencer. For instance, the overall mean level of parasocial relationships of $M = 2.08$ in our study suggests that the few exposure times in our experiment have led to a certain degree of parasocial relationships, but not to strong bonds with the influencer, which might explain the lack of a moderating effect of parasocial relationships. However, we partly addressed this limitation by using a multiple-exposure experiment, in which we also exposed participants to other content of the influencer on several occasions, which also increased the external validity of our design. In single exposure experiments,

which are dominant in current influencer research, no parasocial relationships with fictitious influencers can be built, as parasocial relationships are nurtured by repeated parasocial interaction (Horton & Wohl, 1956). Yet, future experiments should consider even longer familiarization periods with more exposure points. Related to this point, we also found the interaction effect of misinformation exposure and attitude homophily to be present only for levels that go beyond the observed values in the data. The theoretical prediction of these values by the regression model allows inferences about levels higher than the empirically measured levels based on probability estimations. Nevertheless, future research should use a wider scale range for attitude homophily and ensure sufficient exposure points to allow for a development of intense attitude homophily.

It should also be noted that we used a forced-exposure design in our study, while not everyone is exposed to misinformation nor necessarily pays attention to it in real-life settings (Guess & Lyons, 2020). However, rather than assuming universal treatment effects, our study provides, for the first time, a glimpse into factors that determine individuals' susceptibility to influencer's misinformation. Relatedly, the experimental setting of the study might have artificially increased participants' scrutiny, although we mixed the misinformation with unrelated filler posts. Field experiments could address this limitation in future research.

Last, future studies should focus on comparing the effects of influencers' misinformation on young people's thematic misbeliefs to misinformation from other sources, such as politicians, which was beyond the scope of this study. Based on this study, we cannot determine whether the non-significant results and the findings related to the susceptibility factors are specific to misinformation by influencers or apply to misinformation on social media in general. A research design that compares misinformation by influencers to the same claims from other sources may help to juxtapose the effectiveness of misinformation coming from diverse news outlets on social media. For instance, future research should explore

whether perceptions of opinion leadership 1) are more prevalent when people are exposed to influencers' misinformation compared to other sources and 2) account for effects of misinformation on adoption of misbeliefs when tested as a mediator. Drawing from the concept of parasocial opinion leaders (Stehr et al., 2015), perceived opinion leadership of influencers may be higher than that of, for instance, politicians or alternative news platforms, potentially resulting in a higher impact of their misinformation on young people than false claims featured by other sources on social media. Yet, a systematic and controlled comparison of the effects of misinformation provided by these sources is warranted.

Future research should also focus on individuals' processing of influencers' misinformation in contrast to their correct information, and processing of influencers' misinformation compared to misinformation from other sources. In this context, research designs are warranted that allow disentangling whether individuals rely to a stronger degree on heuristic cues such as perceived attractiveness or relatability (e.g., Schouten et al., 2020) when processing misinformation from influencers compared to misinformation originating from other sources.

Implications

Despite these limitations, this study has important theoretical and practical implications. From a theoretical perspective, this study attenuates the role of parasocial relationships as a central driver of influencers' persuasive effects and sheds light on alternative susceptibility factors such as attitude homophily, trust in influencers' issue-specific advice and influencers' issue-specific credibility. From a practical point of view, the results indicate that schools and media literacy organizations should make young people aware that influencers are not to be taken as experts on medical or health issues, as those who believed influencers' advice were more vulnerable to influencers' false claims in our study. Preventing weakening levels of trust in official sources warrants increasing young people's

skeptical evaluation of influencers and their content. Finally, health communicators should focus on making information on medical issues comprehensible and easily accessible, as issue-specific knowledge, which emerged to be negatively associated with misbeliefs in our study, needs to be sustained in times of crisis and uncertainty. After all, a well-informed citizenship is more likely to have confidence in official sources of health information (Freimuth et al., 2014).

Endnotes

[1] Some influencers may not yet have acquired significant reach, but nonetheless aspire "to generate a form of 'celebrity' capital", i.e., to gain recognition and attention (Hearn & Schoenhoff, 2016, p. 194).

[2] Hypotheses numbers differ from OSF pre-registration, but the order is the same.

[3] Although parasocial relationships and attitude homophily—treated as separate variables in this study—tend to be interrelated, parasocial relationships can also develop independent of perceived similarities between recipients and media personalities. When social attraction is included in studies on predictors of parasocial relationships, it tends to outperform attitude homophily (e.g., Schiappa et al., 2007). This suggests that positive parasocial relationships require personae to have desirable personality traits, but they do not have to align with recipients' characteristics.

[4] Originally, H4 included expectations about the preventive effect of 'source-related literacy', for which our measure was not a good fit. For this reason, this variable was excluded from the analysis. The term information-related literacy was changed to issue-specific knowledge to be in line with the existing research on COVID-19-related knowledge.

[5] The pre-registration of the experiment is available on the Open Science Framework (OSF): https://osf.io/8b6er

[6] One author of this study was responsible for the recruitment of participants via flyers on social media platforms and through university channels.

[7] The data and supplementary materials are available on OSF: https://osf.io/v8ngh

[8] Despite a lack of research on influencers' sociodemographics in Belgium, Hopkins (2019) notes that influencer work tends to be female and Abidin (2016) found for Singapore that lifestyle influencers are mostly women between the ages of 18 and 35, while their followers are generally 70% female and range in a similar age span.

[9] If not stated otherwise, all items were measured on a 5-point Likert scale from 1 = strongly disagree to 5 = strongly agree.

[10] Due to a low Cronbach's alpha for the full set of items ($\alpha = .56$), only two items were included in the final analysis measuring negative attitude toward face masks.

[11] We only used two items, because the Cronbach's alpha for the full set of items (five items) was insufficient ($\alpha = .60$).

[12] We talk about influencers' misinformation in the discussion, because in the case of our study, the misinformation was conveyed by an influencer. Yet, we cannot be certain that our results are influencer-specific and might not also apply to other sources of misinformation.

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