





The Relation of Threat Level and Age With Protective Behavior Intentions During Covid-19 in Germany

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Abstract

To contain the spread of Covid-19, engagement in protective behaviors across the population is of great importance. The present study investigated protective behavior intentions during the early phases of Covid-19 in Germany (February 2–April 3, 2020) as a function of threat level and age using data from 4,940 participants in the EUCLID project. Results indicated that the intention to engage in social distancing increased sharply with threat level. Intentions for personal hygiene also increased, although to a lesser extent. While age only had a small overall effect on behavioral intentions, differential patterns emerged. After the lockdown was introduced, the impact of age decreased for social distancing and hygiene behavior intentions but increased for seeing a doctor. Since containing the Covid-19 pandemic depends on high adoption rates of protective behaviors, future research should track sustained phases of the pandemic, including the easing of restrictions and possible new waves of infections.

Keywords

health behavior, infectious disease, emergency, risk and crisis communication

Since the outbreak of Covid-19 in December 2019, the coronavirus has spread rapidly around the globe, appearing in Europe by the end of January 2020 and reaching the level of a global pandemic at the beginning of March (World Health Organization [WHO], 2020c). In the absence of an effective medical treatment or vaccine, massive global public health campaigns have been launched to contain the spread of the coronavirus by promoting social and behavioral strategies to increase protective behaviors in the population (Lunn et al., 2020; WHO, 2020a, 2020b).

Studies of previous infectious disease epidemics suggest that the adoption of protective behaviors varies with the objective threat level of the epidemiological situation, for example, the temporal dynamics of infection rates (Ibuka et al., 2010; Lau et al., 2003). Early data during the emergence of Covid-19 in the United States provided initial evidence for increases in adoption of protective behaviors such as washing hands, social distancing, and staying at home (Wise et al., 2020).

Since the effectiveness of social and behavioral strategies relies on high adoption rates of protective behaviors across the entire population (van Bavel et al., 2020), it is important to identify variables that affect engagement in protective behaviors. Covid-19 is associated with higher mortality rates and health risks for elderly people (Oke & Heneghan, 2020), so the question arises as to whether they are more likely to adopt protective behaviors. While first evidence from the United States suggests that they were slightly more engaged in taking protective measures during the emergence of Covid-19 (Li et al., 2020), a previous review of infectious

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disease pandemics reported mixed findings for age on the adoption of protective behaviors (Bish & Michie, 2010).

The present research therefore aimed to assess the dynamics of engagement in protective behaviors as a function of objective threat levels, with a particular focus on age as a potential moderator. Specifically, using last winter as reference, we assessed the intentions to adopt protective behaviors regarding personal hygiene, social distancing, and seeking medical care (doctor and hospital visits) when experiencing cold symptoms. Data were assessed in a cross-sectional design, covering the emergence of Covid-19 in Germany from the initial stage of the outbreak to after the imposition of the first lockdown. We hypothesized that increasing threat levels would be associated with increased protective behavior intentions, particularly for older adults.

Method

Data were collected in Germany between February 2 and April 3, 2020, as part of the “EUCLID” project (<https://euclid.dbvis.de/>) via online surveys using google forms and the software Qualtrics. The University ethics committee approved the study in March 2020 (ID number 07/ 2020), and it adhered to the declaration of Helsinki. All participants gave informed consent prior to participation.

Participants were recruited via advertising in social media (Facebook, Twitter), Prolific Academic, and email lists using a snowball system. As compensation, participants could take part in a raffle (25€ Amazon vouchers) or received financial reimbursement from Prolific Academic. In total, 5,443 participants were recruited. Of these, 503 were excluded due to missing data on core variables or failed attention checks. The final study sample comprised $N = 4,940$ participants (75.2% women) with a mean age of 33.33 years ($SD = 13.20$; 18–90 years). Overall, 44.1% of the sample indicated being employed or self-employed, while 46.1% were in training or education. The sample included participants from all federal states with the majority from Baden-Wuerttemberg (36.1%), North Rhine-Westphalia (17.1%), and Bavaria (12.0%).

Intentions to engage in protective behavior were assessed by asking, “If you have common cold symptoms during this coronavirus crisis, is it more or less likely that you would behave in the following ways, compared to last winter?” Participants rated the likelihood of (1) avoiding contact with other people more strongly, (2) paying more attention to their personal hygiene (e.g., frequent handwashing), (3) seeing a doctor, and (4) going straight to the hospital on a five-point Likert scale from (1) *very unlikely* to (5) *very likely*.

Dynamics in protective behavior intentions were examined across three time periods, reflecting critical events related to Covid-19 in Germany and an increasing threat level. T1 (February 2–March 7, 2020; $n = 1,144$) represents the early emergence of SARS-CoV-2 with 795 confirmed cases in Germany. T2 (March 8–March 21, 2020; $n = 1,448$) is marked by the first Covid-19 deaths and an accelerating

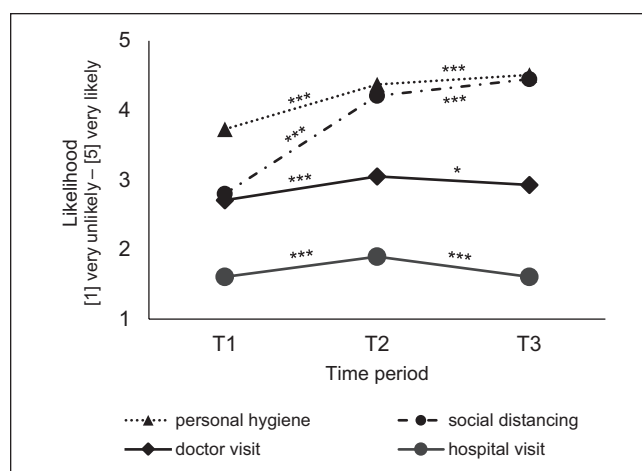


Figure 1. The likelihood of engaging in protective behaviors across the three time periods.

number of confirmed SARS-CoV-2 cases (16,662 confirmed cases in Germany). T3 (March 22–April 3, 2020; $n = 2,348$) started with the introduction of a lockdown and showed a further accelerating number of confirmed SARS-CoV-2 cases (79,696 confirmed cases in Germany).

A 3×4 mixed analysis of variance was conducted, containing factors of Time (T1, T2, and T3) reflecting an increase in the objective Covid-19 threat level, and Protective Behavior (social distancing, personal hygiene, seeing a doctor, going to the hospital). Follow-up post-hoc analyses used Bonferroni corrections. Age effects on behavioral intentions were assessed by linear regressions, using bootstrapping with 1,000 iterations and bias-corrected 95% confidence intervals to test for significance. Data were analyzed using IBM SPSS Statistics (Version 27).

Results

Intentions varied between protective behaviors, $F(3, 14655) = 8021.74$, $p < .001$, $\eta_p^2 = 0.62$. Participants reported being most likely to engage in personal hygiene ($M = 4.29$, $SD = 0.97$) and social distancing behaviors ($M = 4.00$, $SD = 1.17$, $p < .001$), followed by seeing a doctor ($M = 2.91$, $SD = 1.25$, $p < .001$) and going straight to the hospital ($M = 1.69$, $SD = 0.93$, $p < .001$) when showing symptoms of a common cold (see Figure 1). Furthermore, intentions for protective behaviors varied with threat level, i.e., Time, $F(2, 4885) = 374.50$, $p < .001$, $\eta_p^2 = 0.13$, which was further qualified by the interaction of protective behavior and time, $F(6, 14655) = 303.46$, $p < .001$, $\eta_p^2 = 0.11$. Follow-up analyses were therefore conducted for each of the protective behavior intentions.

As shown in Figure 1, the intention to engage in social distancing continuously increased with rising threat levels from T1 ($M = 2.80$, $SD = 1.24$) through T2 ($M = 4.21$, $SD = 0.96$, $p < .001$) to after the imposition of the lockdown (T3: $M = 4.45$, $SD = 0.80$, $p < .001$), $F(2, 4927) = 1180.09$,

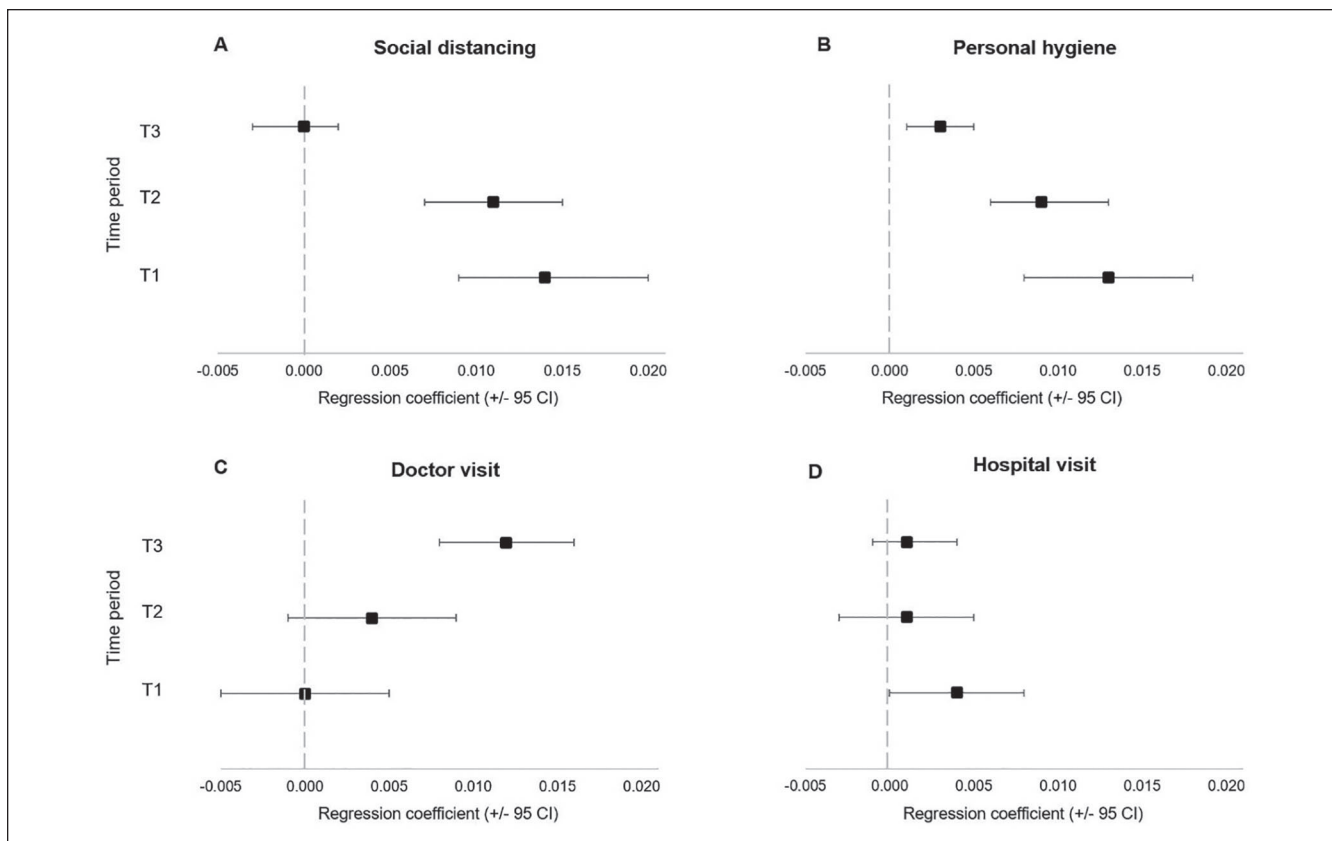


Figure 2. Regression coefficients revealing the association of age and intentions regarding protective behaviors, separately for each behavior (A–D) and time period (T1, T2, and T3).

Note. Error bars are displayed indicating the 95% confidence interval (CI). A CI that does not contain zero is significant.

$p < .001$, $\eta^2 = .32$. Similarly, the intention for personal hygiene continuously increased from the very early emergence of Covid-19 (T1: $M = 3.73$, $SD = 1.21$), after the first deaths (T2: $M = 4.37$, $SD = 0.88$, $p < .001$), to the imposition of the lockdown (T3: $M = 4.51$, $SD = 0.75$, $p < .001$), $F(2, 4914) = 282.89$, $p < .001$, $\eta^2 = .10$.

A different pattern was seen for medical care seeking behaviors. Specifically, intentions to see a doctor increased from the early emergence (T1: $M = 2.71$, $SD = 1.20$) to after the first deaths (T2: $M = 3.05$, $SD = 1.25$, $p < .001$) but decreased after the lockdown (T3: $M = 2.93$, $SD = 1.25$, $p = .013$), $F(2, 4930) = 24.44$, $p < .001$, $\eta^2 = .01$. Similarly, while intentions for hospital visits increased from T1 ($M = 1.61$, $SD = 0.88$) to T2 ($M = 1.90$, $SD = 1.05$, $p < .001$), it decreased from T2 to T3 ($M = 1.61$, $SD = 0.84$, $p < .001$), $F(2, 4921) = 52.24$, $p < .001$, $\eta^2 = .02$, returning to the initial T1 level ($p = 1.00$).

Overall, analyses revealed a small effect of age on intentions for protective behaviors. As shown in Figure 2A and B, the positive relationship of age and intentions for social distancing and personal hygiene decreased across time, indicating that age effects diminished with increasing Covid-19 threat, social distancing: T1 $F(1, 1139) = 28.00$, $p < .001$, $R^2 = .02$, $b = .014$; T2 $F(1, 1442) = 36.18$, $p < .001$, $R^2 = .02$,

$b = .011$; personal hygiene: T1 $F(1, 1139) = 22.86$, $p < .001$, $R^2 = .02$, $b = .013$; T2 $F(1, 1440) = 30.30$, $p < .001$, $R^2 = .02$, $b = .009$. However, while a significant but small association of age remained for personal hygiene after the imposition of the lockdown, T3: $F(1, 2332) = 6.43$, $p = .011$, $R^2 = .003$, $b = .003$, no age effect was revealed for social distancing, T3: $F(1, 2343) = 0.01$, $p = .943$.

A different association emerged for age with medical care seeking behavior (see Figure 2C and D). Specifically, while the intention to see a doctor was not significantly associated with age at T1, $F(1, 1140) = 0.02$, $p = .903$, or T2, $F(1, 1445) = 2.48$, $p = .115$, a significant effect of age was revealed at T3, indicating an increased intention to see a doctor with increasing age, $F(1, 2342) = 37.57$, $p < .001$, $R^2 = .02$, $b = .012$. In addition, intentions regarding hospital visits showed only a marginal positive relationship with age at T1, $F(1, 1134) = 4.21$, $p = .040$, $R^2 = .004$, $b = .004$, and no significant effect at T2, $F(1, 1445) = 0.36$, $p = .550$, or T3, $F(1, 2339) = 1.14$, $p = .285$.

Discussion

The present research examined intentions for protective behaviors across the early phases of Covid-19 in Germany,

starting only a few days after the first cases were reported and ending after the lockdown was introduced. The findings indicate that the intentions to engage in social distancing and personal hygiene behaviors varied across threat levels, with a small differential effect of age on protective behavior intentions. The early assessment allows the investigation of psychobehavioral responses to the pandemic even before it posed an acute threat.

A main finding is that rising threat levels from the emergence of the first cases to the first deaths corresponded with a sharp increase in the intention to engage in social distancing. Notably, this increase was observed in reference to experiencing common cold symptoms during the last winter. The finding of an increased intention to engage in social distancing may be a consequence of activating a sensitized behavioral immune system (Schaller, 2006), since recognizing potential pathogen threat signals is associated with adopting protective behaviors to avoid diseases (Neuberg et al., 2011). Specifically, the emergence of a new infectious disease in concert with rising infection rates may sensitize the behavioral immune system. Thus, the increased intention to engage in social distancing may reflect an increased sensitivity to recognizing visible signals of a pathogen threat. However, relying on the behavioral immune system does not provide sufficient protection from Covid-19, which is characterized by high transmission rates even without showing symptoms (Bai et al., 2020). Public health campaigns have therefore promoted social and behavioral strategies to encourage protective behaviors even in the absence of symptoms to contain the spread of Covid-19 (WHO, 2020a, 2020b). Overall, the finding that the intention to engage in social distancing increased with rising threat levels may reflect both, the sensitization of the behavioral immune system and the deliberate implementation of behavior rules that public health campaigns promote.

Interestingly, during the early emergence of the pandemic, there were similar increases in the likelihood of engaging in both personal hygiene, which is comparably easy to incorporate in daily life routines, and social distancing, which is more difficult to implement and associated with potential costs. Specifically, reducing social contacts could impair social relations, resulting in potentially adverse side effects such as loneliness (Hawkey & Cacioppo, 2010). Thus, the benefit of protection through social distancing must be balanced against potential costs, which may reduce engagement rates and the maintenance of the behavior over prolonged periods of time. While this reasoning may explain different likelihoods of personal hygiene and social distancing behaviors during the early emergence of the pandemic, it is noteworthy that as threat levels increased people were presumably more willing to accept potential social costs to contain the spread of the virus.

An increased threat was not uniformly associated with increased protective behaviors as seeking medical care

decreased after the imposition of the lockdown. This may also reflect official recommendations, as people experiencing symptoms were increasingly advised to self-isolate and seek medical advice over the telephone to also reduce the potential risk of infection when visiting a doctor or the hospital (WHO, 2020b).

A further aim was to determine whether intentions regarding protective behaviors across threat levels vary with age. While a previous review of infectious disease pandemics provided some evidence that older participants are more likely to engage in protective behaviors, the findings were inconclusive (Bish & Michie, 2010). This is relevant for Covid-19, as older participants are more likely to suffer serious health consequences from it (Oke & Heneghan, 2020). Our findings indicate rather small positive associations between age and intentions to engage in social distancing and personal hygiene, and these varied across objective threat levels. Specifically, during the early emergence of the new pandemic, a positive association of age was observed for both the intentions to engage in social distancing and personal hygiene. Specifically, younger adults increased intentions for protective behavior only at higher threat levels, leading to diminished age effects with increasing Covid-19 threat. Furthermore, while age and intentions for medical care seeking behaviors were significantly related, the observed effect sizes were rather small. Specifically, a positive association of age with the intention to see a doctor when experiencing common cold symptoms was only significant after the imposition of the lockdown (T3). Beyond age-related differences in risk sensitivity, this finding may reflect emerging evidence that older people are particularly vulnerable to Covid-19 (Oke & Heneghan, 2020).

When interpreting the results, it should be considered that the present study focused on intentions for protective behaviors. Although the frequency of actual behavior was not assessed, intentions specifically related to Covid-19 allow the examination of motivational and behavioral dynamics in response to the pandemic. Future research could expand the current findings by assessing additional variables, that is, risk perception and self-efficacy, affecting intentions and behavioral action as specified in current health behavior theories (Renner et al., 2015).

Furthermore, limitations of the present research need to be acknowledged. The present convenience sample is on average substantially younger than the German population (33.3 vs. 44.3 years of age, respectively) and includes more female participants (75% vs. 51%, respectively). While age was a continuous predictor in regression analyses, the observed relationship between age and intentions for protective behaviors awaits replication based on representative samples. Furthermore, while not representative, the consistency of the findings regarding protective behavior intentions invites an examination across the full cycle of a pandemic.

Conclusion

The present research provided insights into intentions regarding protective behaviors during a newly emerging infectious disease. Covering the initial phase of the Covid-19 pandemic, intentions for protective behaviors, namely, social distancing and personal hygiene, increased with increasing threat levels. Furthermore, intentions regarding protective behaviors were found to vary little with age, even though Covid-19's mortality and health risk increase with age. Tracking intentions toward protective behaviors across continuing phases of the pandemic may inform the design of public health campaigns.

Authors' Note

Any underlying research materials related to the present manuscript (e.g., data sets) are available from the corresponding author on reasonable request.

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