

Just in time

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Just in Time

Applying behavioral science to create a safe university environment in times of the COVID-19 pandemic

Tuğçe Varol

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Just in Time

Applying behavioral science to create a safe university
environment in times of the COVID-19 pandemic

DISSERTATION

To obtain the degree of Doctor at the Maastricht University,
on the authority of the Rector Magnificus,
Prof. dr. Pamela Habibović
in accordance with the decision of the Board of Deans,
to be defended in public
on Thursday 29 June 2023, at 16:00 hours

by

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Chapter 1

General Introduction

General Introduction

Every story has a beginning ...

In December 2019, when the first official COVID-19 case was identified in China, I was doing my master's degree in Health and Social Psychology at Maastricht University, the Netherlands. At that time, we could still attend on-site education, and the idea of online or hybrid education was not in the air. Everything appeared to be normal. We were following the news on COVID-19 from afar. Only a few months later, the first official case in the Netherlands was identified in February 2020, and everything changed in the blink of an eye. The World Health Organization declared COVID-19 a pandemic in March 2020, leading to a feeling of uneasiness due to many uncertainties regarding the virus, not only for me but also for other (international) students.

It was real. It was with us. Our new hobby became tracking the number of COVID-19 cases and hospitalizations on a daily basis. The Dutch news was disclosing the prospect of the Netherlands' first lockdown occurring soon. As master's students, my friends and I were anxiously discussing the potential consequences of the lockdown: staying in the Netherlands, turning home, the possibility of an air traffic ban, catching the virus...

The Dutch government announced the first lockdown on March 15, 2020. We, Maastricht University students, received an email from the university indicating that due to the new regulations pertaining to the lockdown, the education would continue online, and the university premises would be closed until further notice. While many students returned home immediately, I was naively optimistic and assured myself that everything would be back to normal in May 2020. Yet, although we saw decreases in the numbers of cases and hospitalizations in the summer of 2020, prompting the Dutch government to relax some of the COVID-19 regulations, we did not return to campus education. That summer, I completed my master's degree online.

During the summer of 2020, Maastricht University was preparing for the new academic year. In the light of the government's slightly loosened advice, the university decided to offer hybrid education in the academic year 2020–2021, which allowed students to come to campus. In order to safely welcome students to the university facilities, Maastricht University implemented the guidelines issued by the National Institute for Public Health and the Environment (RIVM) and the Dutch government within the university, such as keeping a 1.5m distance from others, avoiding crowds, regular testing, and isolating when having symptoms. Apart from the university's regulations and infrastructural modifications, the key to combating the virus was human conduct, including whether students adhered to COVID-19 regulations or not.

The University Board asked a group of their own experts on behavior change, health promotion, and epidemiology to provide support in dealing with the COVID-19 pandemic within the university. Since there was a limited amount of literature available on determinants of students' adherence to COVID-19 guidelines within a university setting, and since Maastricht University is not only an educational but also a scientific institute, this group decided to provide empirically collected information to the University Board and use their expertise in behavior change to develop theory- and evidence-based interventions to support the board in addressing COVID-19 within the university.

... and this was the beginning of my PhD story and this thesis.

The COVID-19 Pandemic

The coronavirus disease (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was officially identified first in Wuhan, China in December 2019 (Adhikari et al., 2020; Ali & Alharbi, 2020). The initially identified cases were found to be linked to a Seafood Market in Wuhan, implying that the virus was spread from animal to human, specifically from bat to human. However, no link to the animal market was found in the later cases, indicating a human-to-human transition of the virus (Adhikari et al., 2020). SARS-CoV-2 belongs to the family of coronaviruses, which are zoonotic in nature and transmit from animal to human through direct or indirect contact. Human coronaviruses can also transmit from human to human. To date (2022), there have been seven coronaviruses detected in humans: HCoV-229E, HCoV-OC43, SARS-CoV, HCoV-NL63, HCoV-HKU1, MERS-CoV, SARS-CoV-2. From these, SARS-CoV, and MERS-CoV led to epidemics, i.e., SARS in 2003, MERS in 2012, and SARS-CoV-2 led to a pandemic, i.e., COVID-19 in 2020 (Abdelrahman et al., 2020; Adhikari et al., 2020; Ali & Alharbi, 2020; Chatterjee et al., 2020). Human-to-human transmission of SARS-CoV-2 occurs mainly via respiratory droplets from an infected person's cough or sneeze. Close contact with an infected person and aerosol transmission are two further modes of transmission (Adhikari et al., 2020; Ciotti et al., 2020).

The most common acute symptoms of COVID-19 disease are fever, cough and shortness of breath, while diarrhea, vomiting, and abdominal pain are less common (Ciotti et al., 2020; Rehman et al., 2021). COVID-19 cases range from mild to severe, however, there are also asymptomatic people who are infected with the virus but do not show any symptoms (Bai et al., 2020; Gao et al., 2021; Kronbichler et al., 2020). The severity of outcomes depends on the person's underlying conditions, such as cancer, diabetes, and cardiovascular diseases (Chatterjee et al., 2020; Ciotti et al., 2020). Some people, who have recovered from COVID-19 disease, may continue experiencing the symptoms or develop new ones. The persistence of symptoms such as fatigue, headache, shortness of breath, and cognitive or mental impairments for weeks or months after the initial infection from SARS-CoV-2 is called "long COVID" or "post-COVID syndrome" (Raveendran et al., 2021; Yong, 2021). As the virus profile changes due to mutations, the symptoms may alter as well.

COVID-19 Preventive Behaviours

In the earlier stages of the pandemic, health authorities recommended that everyone comply with preventive behaviours to minimise the spread of the virus. Due to the possibility of human-to-human transmission, suggested preventive behaviours aimed at limiting physical contact and included behaviours such as physical distancing,

avoiding crowds, washing hands with soap, using hand sanitizer, wearing face masks, getting tested, and isolating when having symptoms or being in touch with someone who has COVID-19 (Adhikari et al., 2020; Ali & Alharbi, 2020; Chatterjee et al., 2020; Mishra & Tripathi, 2021). After the development and approval of COVID-19 vaccinations, health authorities extended their recommendations and suggested that everyone get vaccinated against COVID-19 in addition to maintaining compliance with other preventive measures (World Health Organization, 2020a). COVID-19 vaccines were shown to increase immunization and prevent the severe consequences of getting infected with the virus (Barda et al., 2021; Deplanque & Launay, 2021; Niessen et al., 2022; Zheng et al., 2022). Although these preventive behaviours were considered a way out of this pandemic, reaching this goal could only be accomplished by high levels of public adherence to these measures.

Higher Education and the COVID-19 Pandemic

The COVID-19 pandemic had an impact not only on the health of people but also on society, the economy, and education. Due to the measures taken to control the spread of the virus, such as lockdowns and social distancing, traditional forms of education have been disrupted, and many educational institutes adopted online and remote teaching methods, which were new to many teachers and students (Mishra et al., 2020; Rashid & Yadav, 2020). The negative impact of the transition to fully online education on the educational and personal development and well-being of students in the first year of the COVID-19 pandemic was discussed, and the factors behind this negative impact ranged from technical to social and psychological challenges, such as computer-related issues, perceived higher workload, future job insecurities, anxiety, and lack of social contact (Aristovnik et al., 2020; Nurunnabi et al., 2020; Sahu, 2020). Amid the COVID-19 pandemic, educational institutions were searching for solutions to safely return to campus education to limit future negative impacts on students' development and well-being.

In the Netherlands, the Dutch government announced stricter measures and the first national lockdown directly after the World Health Organization (WHO) declared COVID-19 a pandemic in March 2020 (Government of the Netherlands, 2020a, 2020b; World Health Organization, 2020b). This led to the closure of all non-essential stores as well as schools and universities (Government of the Netherlands, 2020b). Higher educational institutes were asked to offer fully online education to their students. For employees, the new norm was “work-from-home” (Government of the Netherlands, 2020a). On June 15th, 2020, higher education institutions were allowed to reopen again

to a limited degree. Exams and practical trainings were allowed to take place on campus (De Boer, 2021; Government of the Netherlands, 2020c). During the summer of 2020, the Dutch government's recommendations for higher education were that on-site education was possible, but activities took place in small groups, and everyone had to follow the 1.5m distancing rule. Other measures included such as washing hands, staying at home and getting tested when having symptoms, and avoiding crowds (Government of the Netherlands, 2020d, 2020e).

Maastricht University and the COVID-19 Pandemic

Following the measures taken by the Dutch government, Maastricht University (UM) offered entirely online education until the end of the academic year 2019 – 2020. In the academic year thereafter (2020 – 2021), the UM Board decided to continue with hybrid education, the combination of online and on-site education, to prevent the negative impact of solely online education on students. To ensure the safety of students and staff members, UM developed a safety protocol, which was based on the guidelines of the National Institute for Public Health and the Environment (RIVM) and the Dutch government. The protocol included regulations such as keeping ≥ 1.5 m-distance, washing or disinfecting hands, staying at home, or getting tested when having complaints. In addition to these regulations, the university made infrastructural adjustments, such as walking lines, removing seats to limit the number of people sitting at one table, and sufficient ventilation. Moreover, the number of students was limited depending on the size of the room to make sure that ≥ 1.5 m-distancing regulation was followed. Corona stewards and security were employed to enforce COVID-19 regulations within the university facilities.

Applying Planned Behavior Change Within a University Setting

The COVID-19 pandemic highlighted the significance of human behavior in disease prevention and health promotion. The effectiveness of measures recommended by health authorities and governments to prevent and control the spread of the virus was primarily reliant on human behavior. As a result, people's adherence to COVID-19 measures was one of the key factors in combating the pandemic. Insights from disciplines such as health psychology, health promotion, applied social psychology and communication science shed light on how to use evidence and theories to develop interventions to modify the behavior of both individuals and other relevant stakeholders (Bavel et al., 2020; Betsch, 2020; West et al., 2020). Therefore, having experts with a behavioral science background in the planning committees, which also involve

representatives from adopting and implementing organizations, was critical for making decisions on policies and guidelines.

Changing behavior is not easy, and in the case of a pandemic, fast, wide-scale behavior change was even more challenging. As a result, the need for immediate behavior change interventions and expertise in behavior change were essential. Planned behavior change starts with a problem analysis. This phase includes an in-depth understanding of the problem at hand by focusing on its effects on the quality of life of people, the identification of behaviors that are leading to the problem, and factors associated with these problematic behaviors (Kok et al., 1996). Also, in the case of combatting the COVID-19 pandemic at Maastricht University, a needs assessment to gather information on the problem and its underlying factors was the first step to achieving behavior change. Upon a full understanding of the problem, the subsequent steps are the planning of a behavior change (program) and its implementation and evaluation (Kok et al., 1996; Wight et al., 2016). There are several tools that foster the systematic planning of intervention development. In this dissertation, we used Core Processes and Intervention Mapping.

Core Processes

Core Processes is a six-step approach to systematically finding answers to planning questions during intervention development (Ruiter & Crutzen, 2020). It helps researchers ensure that they use expert knowledge, empirical findings, and theories thoroughly in different steps of intervention development (e.g., intervention design, implementation, etc.). These six steps have a fixed order starting from 1) posing questions, 2) brainstorming on possible answers to the questions within the expert group, 3) searching empirical evidence to support or refute the answers, 4) searching theories (through three approaches: the topic approach, the concept approach and the general theories approach; again, with a fixed order), 5) conducting new research if necessary, and 6) finalizing the list of answers. Core Processes can be used in every step of intervention development.

Intervention Mapping

Intervention Mapping (IM) is a planning protocol for theory- and evidence-based intervention development (Bartholomew Eldredge et al., 2016; Fernandez et al., 2019a). This dissertation used the IM framework extensively while conducting studies and developing interventions. The perspectives of the IM protocol are: 1) the use of available empirical findings and theories to inform the planned development of a health promotion intervention, 2) a participatory approach, where people who form the target

population, or other stakeholders such as adopters and implementers, are involved in the decision-making process of intervention design, implementation, and evaluation, 3) the socio-ecological model, in which human behavior is not only determined by individuals but also by the social, organizational, build, and policy environments in which individuals live and work.

IM involves six reiterative and cumulative steps that inform the intervention development, and the planning of implementation and evaluation (Bartholomew Eldredge et al., 2016; Fernandez et al., 2019a). Step 1 is the *Logic Model of the Problem*, where intervention developers conduct a needs assessment to gather information on the health problem, problematic behaviors, and environmental conditions. Moreover, the determinants of problematic behaviors and environmental conditions are identified. Step 2 is the *Logic Model of Change*, where intervention developers state the desired behaviors and sub-behaviors (performance objectives) for individual and environmental agents to achieve the behavior change. Determinants of the desired behaviors are selected as targets for the planned intervention. Step 3 is the *Program Design*, where intervention developers select theory- and evidence-based behavior change methods, which can be determinant specific or work on more than one determinant. These methods are translated into practical applications by meeting the parameters of their effectiveness (Kok, 2014; Kok et al., 2016). Step 4 is the *Program Production* where the actual program components are developed, such as drafting the messages, and pre- and pilot tested. Step 5 is the *Program Implementation Plan*, where strategies for the program adoption, implementation and maintenance were developed (Fernandez et al., 2019b). Step 6 is the *Evaluation Plan*, where the effect and process evaluation of the intervention is planned. Steps 5 and 6 are already anticipated from the start.

Overview of This Thesis

Maastricht University opted for hybrid education in the academic year 2020 – 2021. This decision also brought the responsibility of creating a safe environment for students and employees of the university. In addition to the various teams that are ensuring the safety in the university, the University Board requested support in tackling the COVID-19 pandemic at the university from our team involving experts from different disciplines. This dissertation concerns the studies that were conducted and interventions that were developed during the period of September 2020 – September 2021 to support the University Board in their decision-making process towards containment of the virus and providing a safe working and studying environment.

From September to December 2020, the focus was mainly on students' adherence to guidelines of the university, such as distancing, testing, and isolation. Despite the infrastructural changes to facilitate the safety of university students and staff, the COVID-19 pandemic demonstrated the importance of behavioral change. Hence, enhancing adherence to COVID-19 guidelines was one of the goals (also worldwide) to achieve safety. To attain this goal, the reasons behind (or determinants of) people's adherence behavior needed to be studied. Therefore, **Chapter 2** (Study 1) explores the barriers and facilitators behind university students' (non)adherence to COVID-19 guidelines within the university by means of interviews with students, stewards, and security/crowd control officials.

The findings of the qualitative inquiry shed light on determinants of students' adherence to guidelines. However, having knowledge of determinants does not necessarily mean that all determinants are relevant targets for an intervention that aims to increase adherence. The most relevant ones (most important and changeable) need to be selected as targets of future interventions. Therefore, we conducted a quantitative study (in October – November 2020) to identify the determinants of students' adherence to COVID-19 guidelines of the university. The studied behaviors were 1) adherence to general COVID-19 guidelines, and the two most important specific guidelines: 2) keeping at least 1.5 m distance, and 3) staying at home and getting tested when having symptoms. **Chapter 3** (Study 2) identifies the most relevant determinants of students' adherence to COVID-19 guidelines of the university and describes a small intervention, a Christmas/New Year message, for a safe festive break, by targeting those relevant determinants.

Until COVID-19 vaccines became available in the Netherlands in January 2021 (Rijksoverheid, 2022), the emphasis was on behaviors to avoid infection and spread of the virus (Khan et al., 2021). After availability, a new behavior was added, namely vaccination uptake. The elderly (being a high-risk population) and care workers were prioritized for immunization. Based on age categories (from older adults to youngsters), batches of people were invited to be vaccinated (National Institute for Public Health and the Environment, 2020). University students became eligible for the vaccination against COVID-19 in June/July 2021. High vaccination uptake was considered important to improve safety for students and personnel when on campus. To support vaccination uptake, an intervention was developed to support Maastricht University students in their vaccination decision making. The development was preceded by a survey study in March 2021. **Chapter 4** (Study 3), therefore, examines university students' intention to get the COVID-19 vaccine, select the most relevant determinants of students' intention to vaccinate against COVID-19, and gather information on the channels for effective communication about COVID-19 vaccination.

Due to the continuously changing profile of the COVID-19 pandemic, speedy development of interventions was required to act promptly. Following the Intervention Mapping framework, we developed an online vaccination intervention (i.e., vaccination webpage), which was launched once students became eligible for the COVID-19 vaccine. The vaccination webpage included videos on COVID-19 vaccination, a frequently asked questions section, and interviews with university experts covering the relevant determinants of students' vaccination intention. **Chapter 5** introduces the development of the online intervention following the Intervention Mapping steps and discusses the lessons learned from the speedy process of intervention development.

After battling the COVID-19 pandemic for the academic year (2020 – 2021), societies were in a different phase, preparing to return to normal. As the COVID-19 pandemic harmed students and staff members, and given the increase in vaccination coverage, universities were eager to welcome the students and staff back to their faculties in September 2021 (Brammer & Clark, 2020). Therefore, the new goal was to make this transition as smooth and safe as possible. When preparing for the new academic year, two factors were deemed important and needed to be investigated by considering the stakeholders' perspectives on 1) perceived safety of personnel within the university despite the increase in vaccination coverage, and 2) return to normal education and work environments after spending more than one year at home. Therefore, we conducted a study to support the university board in their decision-making for the new academic year. **Chapter 6** (Study 4) explores the feelings of safety among university personnel when imagining returning to Maastricht University in September 2021, by asking them about (a) positive and negative attitudinal beliefs, (b) trust and worries, and (c) preventive measures, especially COVID-19 vaccination uptake.

Chapter 7 provides a discussion of the studies that were conducted and the interventions that were developed and discusses the methodological, practical, and future considerations. After the discussion, the dissertation ends with a general summary of the conducted research and its findings, and an impact paragraph.

References

- Abdelrahman, Z., Li, M., & Wang, X. (2020). Comparative Review of SARS-CoV-2, SARS-CoV, MERS-CoV, and Influenza A Respiratory Viruses. *Frontiers in Immunology*, *11*. <https://www.frontiersin.org/articles/10.3389/fimmu.2020.552909>
- Adhikari, S. P., Meng, S., Wu, Y.-J., Mao, Y.-P., Ye, R.-X., Wang, Q.-Z., Sun, C., Sylvia, S., Rozelle, S., Raat, H., & Zhou, H. (2020). Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: A scoping review. *Infectious Diseases of Poverty*, *9*(1), 29. <https://doi.org/10.1186/s40249-020-00646-x>
- Ali, I., & Alharbi, O. M. L. (2020). COVID-19: Disease, management, treatment, and social impact. *Science of The Total Environment*, *728*, 138861. <https://doi.org/10.1016/j.scitotenv.2020.138861>
- Aristovnik, A., Keržič, D., Ravšelj, D., Tomaževič, N., & Umek, L. (2020). Impacts of the COVID-19 Pandemic on Life of Higher Education Students: A Global Perspective. *Sustainability*, *12*(20), Article 20. <https://doi.org/10.3390/su12208438>
- Bai, Y., Yao, L., Wei, T., Tian, F., Jin, D. Y., Chen, L., & Wang, M. (2020). Presumed asymptomatic carrier transmission of COVID-19. *Jama*, *323*(14), 1406-1407. <https://doi.org/10.1001/jama.2020.2565>
- Barda, N., Dagan, N., Cohen, C., Hernán, M. A., Lipsitch, M., Kohane, I. S., ... Balicer, R. D. (2021). Effectiveness of a third dose of the BNT162b2 mRNA COVID-19 vaccine for preventing severe outcomes in Israel: an observational study. *The Lancet*, *398*(10316), 2093-2100. [https://doi.org/10.1016/S0140-6736\(21\)02249-2](https://doi.org/10.1016/S0140-6736(21)02249-2)
- Bartholomew Eldredge, L. K., Markham, C. M., Ruitter, R. A. C., Fernández, M. E., Kok, G., & Parcel, G. S. (2016). *Planning health promotion programs: an intervention mapping approach*. John Wiley & Sons.
- Bavel, J. J. V., Baicker, K., Boggio, P. S., Capraro, V., Cichocka, A., Cikara, M., Crockett, M. J., Crum, A. J., Douglas, K. M., Druckman, J. N., Drury, J., Dube, O., Ellemers, N., Finkel, E. J., Fowler, J. H., Gelfand, M., Han, S., Haslam, S. A., Jetten, J., ... Willer, R. (2020). Using social and behavioural science to support COVID-19 pandemic response. *Nature Human Behaviour*, *4*(5), 460-471. <https://doi.org/10.1038/s41562-020-0884-z>
- Betsch, C. (2020). How behavioural science data helps mitigate the COVID-19 crisis. *Nature Human Behaviour*, *4*(5), Article 5. <https://doi.org/10.1038/s41562-020-0866-1>
- Brammer, S., & Clark, T. (2020). COVID-19 and Management Education: Reflections on Challenges, Opportunities, and Potential Futures. *British Journal of Management*, *31*(3), 453-456. <https://doi.org/10.1111/1467-8551.12425>
- Chatterjee, P., Nagi, N., Agarwal, A., Das, B., Banerjee, S., Sarkar, S., Gupta, N., & Gangakhedkar, R. R. (2020). The 2019 novel coronavirus disease (COVID-19) pandemic: A review of the current evidence. *The Indian Journal of Medical Research*, *151*(2-3), 147-159. https://doi.org/10.4103/ijmr.IJMR_519_20
- Ciotti, M., Ciccozzi, M., Terrinoni, A., Jiang, W.-C., Wang, C.-B., & Bernardini, S. (2020). The COVID-19 pandemic. *Critical Reviews in Clinical Laboratory Sciences*, *57*(6), 365-388. <https://doi.org/10.1080/10408363.2020.1783198>
- De Boer, H. (2021). COVID-19 in Dutch higher education. *Studies in Higher Education*, *46*(1), 96-106. <https://doi.org/10.1080/03075079.2020.1859684>
- Deplanque, D., & Launay, O. (2021). Efficacy of COVID-19 vaccines: From clinical trials to real life. *Therapies*, *76*(4), 277-283. <https://doi.org/10.1016/j.therap.2021.05.004>

- Fernandez, M. E., Ruiter, R. A. C., Markham, C. M., & Kok, G. (2019a). Intervention Mapping: Theory- and Evidence-Based Health Promotion Program Planning: Perspective and Examples. *Frontiers in Public Health*, 7. <https://doi.org/10.3389/fpubh.2019.00209>
- Fernandez, M. E., ten Hoor, G. A., van Lieshout, S., Rodriguez, S. A., Beidas, R. S., Parcel, G., Ruiter, R. A. C., Markham, C. M., & Kok, G. (2019b). Implementation Mapping: Using Intervention Mapping to Develop Implementation Strategies. *Frontiers in Public Health*, 7. <https://www.frontiersin.org/articles/10.3389/fpubh.2019.00158>
- Gao, Z., Xu, Y., Sun, C., Wang, X., Guo, Y., Qiu, S., & Ma, K. (2021). A systematic review of asymptomatic infections with COVID-19. *Journal of Microbiology, Immunology and Infection*, 54(1), 12-16. <https://doi.org/10.1016/j.jmii.2020.05.001>
- Government of the Netherlands (2020a). *New measures to stop spread of coronavirus in the Netherlands*. <https://www.government.nl/latest/news/2020/03/12/new-measures-to-stop-spread-of-coronavirus-in-the-netherlands>
- Government of the Netherlands (2020b). *COVID-19: Additional measures in schools, the hospitality sector and sport*. <https://www.government.nl/latest/news/2020/03/15/additional-measures-in-schools-the-hospitality-sector-and-sport>
- Government of the Netherlands (2020c). *Tackling coronavirus: the next step*. <https://www.government.nl/latest/news/2020/05/19/tackling-coronavirus-the-next-step>
- Government of the Netherlands (2020d). *From 1 July: staying 1.5 metres apart remains the norm*. <https://www.government.nl/ministries/ministry-of-health-welfare-and-sport/news/2020/06/24/from-1-july-staying-1.5-metres-apart-remains-the-norm>
- Government of the Netherlands (2020e). *Regaining control over coronavirus with local measures*. <https://www.government.nl/latest/news/2020/08/06/regaining-control-over-coronavirus-with-local-measures>
- Khan, M., Adil, S. F., Alkhatlan, H. Z., Tahir, M. N., Saif, S., Khan, M., & Khan, S. T. (2021). COVID-19: A Global Challenge with Old History, Epidemiology and Progress So Far. *Molecules*, 26(1), Article 1. <https://doi.org/10.3390/molecules26010039>
- Kok, G. (2014). A practical guide to effective behavior change: How to apply theory-and evidence-based behavior change methods in an intervention. *European Health Psychologist*, 16(5), 156-170. <https://doi.org/10.31234/osf.io/r78wh>
- Kok, G., Gottlieb, N. H., Peters, G.-J. Y., Mullen, P. D., Parcel, G. S., Ruiter, R. A. C., Fernández, M. E., Markham, C., & Bartholomew, L. K. (2016). A taxonomy of behaviour change methods: An Intervention Mapping approach. *Health Psychology Review*, 10(3), 297–312. <https://doi.org/10.1080/17437199.2015.1077155>
- Kok, G., Schaalma, H., De Vries, H., Parcel, G., & Paulussen, T. (1996). Social Psychology and Health Education. *European Review of Social Psychology*, 7(1), 241–282. <https://doi.org/10.1080/14792779643000038>
- Kronbichler, A., Kresse, D., Yoon, S., Lee, K. H., Effenberger, M., & Shin, J. I. (2020). Asymptomatic patients as a source of COVID-19 infections: A systematic review and meta-analysis. *International Journal of Infectious Diseases*, 98, 180-186. <https://doi.org/10.1016/j.ijid.2020.06.052>
- Mishra, L., Gupta, T., & Shree, A. (2020). Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. *International Journal of Educational Research Open*, 1, 100012. <https://doi.org/10.1016/j.ijedro.2020.100012>
- Mishra, S. K., & Tripathi, T. (2021). One year update on the COVID-19 pandemic: Where are we now? *Acta Tropica*, 214, 105778. <https://doi.org/10.1016/j.actatropica.2020.105778>

- National Institute for Public Health and the Environment (2020). *First COVID-19 vaccination in the Netherlands on 8 January 2021*. <https://www.rivm.nl/en/news/first-covid-19-vaccination-on-8-january-2021>
- Niessen, F. A., Knol, M. J., Hahné, S. J. M., Bonten, M. J. M., & Bruijning-Verhagen, P. C. J. L. (2022). Vaccine effectiveness against COVID-19 related hospital admission in the Netherlands: A test-negative case-control study. *Vaccine*, *40*(34), 5044–5049. <https://doi.org/10.1016/j.vaccine.2022.06.011>
- Nurunnabi, M., Almusharraf, N., & Aldeghaither, D. (2020). Mental Health and Well-Being during the Covid-19 Pandemic in Higher Education: Evidence from G20 Countries. *Journal of Public Health Research*, *9*(1_suppl), jphr.2020.2010. <https://doi.org/10.4081/jphr.2020.2010>
- Rashid, S., & Yadav, S. S. (2020). Impact of Covid-19 pandemic on higher education and research. *Indian Journal of Human Development*, *14*(2), 340–343. <https://doi.org/10.1177/0973703020946700>
- Raveendran, A. V., Jayadevan, R., & Sashidharan, S. (2021). Long COVID: An overview. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *15*(3), 869–875. <https://doi.org/10.1016/j.dsx.2021.04.007>
- Rehman, M. F. ur, Fariha, C., Anwar, A., Shahzad, N., Ahmad, M., Mukhtar, S., & Farhan Ul Haque, M. (2021). Novel coronavirus disease (COVID-19) pandemic: A recent mini review. *Computational and Structural Biotechnology Journal*, *19*, 612–623. <https://doi.org/10.1016/j.csbj.2020.12.033>
- Rijksoverheid. (2022). *Coronavirus dashboard. What can you do. COVID-19 vaccinations*. <https://coronadashboard.government.nl/landelijk/vaccinaties>
- Ruiter, R. A. C., & Crutzen, R. (2020). Core Processes: How to Use Evidence, Theories, and Research in Planning Behavior Change Interventions. *Frontiers in Public Health*, *8*. <https://doi.org/10.3389/fpubh.2020.00247>
- Sahu, P. (2020). Closure of Universities Due to Coronavirus Disease 2019 (COVID-19): Impact on Education and Mental Health of Students and Academic Staff. *Cureus*, *12*(4). <https://doi.org/10.7759/cureus.7541>
- West, R., Michie, S., Rubin, G. J., & Amlôt, R. (2020). Applying principles of behaviour change to reduce SARS-CoV-2 transmission. *Nature Human Behaviour*, *4*(5), 451–459. <https://doi.org/10.1038/s41562-020-0887-9>
- Wight, D., Wimbush, E., Jepson, R., & Doi, L. (2016). Six steps in quality intervention development (6SQuID). *J Epidemiol Community Health*, *70*(5), 520–525. <http://dx.doi.org/10.1136/jech-2015-205952>
- World Health Organization. (2020a). *Behavioural considerations for acceptance and uptake of COVID-19 vaccines: WHO technical advisory group on behavioural insights and sciences for health, meeting report, 15 October 2020*. World Health Organization. <https://apps.who.int/iris/handle/10665/337335>
- World Health Organization. (2020b). *WHO Director-General's opening remarks at the media briefing on COVID-19*. <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>
- Yong, S. J. (2021). Long COVID or post-COVID-19 syndrome: Putative pathophysiology, risk factors, and treatments. *Infectious Diseases*, *53*(10), 737–754. <https://doi.org/10.1080/23744235.2021.1924397>
- Zheng, C., Shao, W., Chen, X., Zhang, B., Wang, G., & Zhang, W. (2022). Real-world effectiveness of COVID-19 vaccines: a literature review and meta-analysis. *International Journal of Infectious Diseases*, *114*, 252–260.

Chapter 2

University Students' Adherence to COVID-19 Guidelines: A Qualitative Study on Facilitators and Barriers

This chapter is based on: Varol, T., Schneider, F., Mesters, I., Crutzen, R., Ruiter, R. A. C., Kok, G., & Ten Hoor, G. (2021). University students' adherence to the COVID-19-guidelines: A qualitative study on facilitators and barriers. *Health Psychology Bulletin*, 5(1). <http://doi.org/10.5334/hpb.32>

Abstract

Objective: This study aimed to explore students' adherence and reasons behind the (non)adherence to COVID-19 regulations within a university setting.

Methods: A total of 33 students participated in on-site and online focus group interviews ($k = 8$). Discussed topics included the general COVID-19-guidelines of the university, including keeping ≥ 1.5 m distance, staying at home and getting tested when having symptoms, and wearing facemasks. Additionally, education and psychosocial wellbeing in times of COVID-19 were discussed. We also conducted online interviews with stewards (2 focus group interviews and 1 individual interview) and security/crowd control officials (1 focus group interview) to learn more about students' (non) adherence behaviors.

Results: The findings of this study show that the interviewed students were willing to adhere to the guidelines within the university buildings. They mentioned several facilitators (e.g., the infrastructure of the buildings and staff) and barriers (e.g., being together with friends and difficulties with telling others to follow the regulations) for their compliance behaviors. Some students also stated that they are not afraid of COVID-19 because they are young, while others adhered to the regulations to protect vulnerable people. Focus group interviews with stewards/security did not add anything new to the findings.

Conclusion: To create a safe environment within the university and alleviate the spread of the virus, future interventions require targeting the determinants of students' non-adherence behaviors, such as lower risk perception (e.g., being young and no perceived threat/low vulnerability) and lower self-efficacy (e.g., for keeping distance, to determine symptoms for testing/isolating and to correct others).

Keywords: COVID-19; students; beliefs; guidelines; adherence; behavior change

Introduction

The novel COVID-19 disease rapidly spread worldwide and was declared a pandemic by the World Health Organization (WHO, 2020a). Up till the moment that there is an effective and widely used medication and/or vaccine, health professionals recommend preventive behavioral measures to reduce the spread of the virus, such as hand hygiene, physical distancing, getting tested and quarantine, and wearing facemasks (Adhikari et al., 2020; Singhal, 2020; WHO, 2020b).

The first COVID-19 case of the Netherlands was confirmed on February 27, 2020 (RIVM, 2020). Since then, the number of cases drastically increased, and in the Netherlands the government announced the first intelligent lockdown on March 15, 2020, including closures of cafes, restaurants, bars, and schools (Rijksoverheid, 2020a). Intelligent lockdown refers to the combination of all measures to control the spread of the virus and minimize the effect of COVID-19 pandemic on economy and wellbeing by giving people advise and putting the emphasis on individual responsibility (Yerkes et al., 2020). Early June, when the reproduction number (R_0) returned below 1, measures were somewhat relaxed and facilities in the Netherlands reopened again, but in such a way that people were able to follow the >1.5-metre physical distancing rule (Rijksoverheid, 2020b). At the time of writing this chapter, the second wave of COVID-19 had been observed across Europe (including the Netherlands) and a full lockdown with additional restrictive measures was implemented on December 16, 2020.

Education programs from primary to tertiary level have also been impacted by COVID-19 (Sahu, 2020; Toquero, 2020), and schools and universities are trying to find ways to deliver educational activities without any postponement. Maastricht University (approximately 19,000 students, 54% of whom are foreign: [maastrichtuniversity.nl/about-um/organisation/facts-figures](https://www.maastrichtuniversity.nl/about-um/organisation/facts-figures)), where this study took place, adopted a hybrid education system, which allows online learning alongside in-person learning. The University Board applied the regulations of the National Institute for Public Health and the Environment (RIVM) in all educational facilities: keeping ≥ 1.5 m-distance, washing or disinfecting hands, staying at home or getting tested when having complaints, and wearing facemasks (implemented from October 26, 2020). Besides, surveillance was established by corona stewards/security enforcing the COVID-19 rules on-site.

In an educational environment, preventing the spread of the virus also depends on the compliance behaviors of students with the preventive measures. As a first step in the development of an intervention to promote a safe environment for students by increasing adherence to the measures, applying the Intervention Mapping (IM) approach (Bartholomew-Eldredge et al., 2016; Fernandez et al., 2019), we conducted a

needs assessment to gather information about the determinants and underlying beliefs behind the students' risk and preventive behaviors. In this study, we aimed to learn: a) students' adherence to the guidelines; and b) reasons behind students' (non) adherence to the guidelines, applying a qualitative approach. Based on the outcomes of this study, we will be able to identify the determinants and underlying beliefs behind students' (non)adherence behavior, which are the key elements of changing a behavior, and inform a quantitative survey to tailor the questionnaire based on the students' beliefs. The most relevant beliefs will serve as change objectives for a future intervention to promote (better) compliance with the preventive measures.

Methods

Participants and Recruitment

After receiving approval by the Ethics Review Committee Psychology and Neuroscience, Maastricht University, students were invited to the study through the university's communication channels (e.g., newsletter, pop-up in the online learning management system (CANVAS) and student email), which included a recruitment paragraph with a registration link (aanmelder.nl/um-covid-19: an event page created for this study). The ideal number of participants for a focus group is between 5 to 8 (e.g., Bloor, 2001; Krueger & Casey, 2014). Therefore, of 118 students who registered for the study, 48 students were selected for 4 on-site (with 7 students for each) and 4 online (with 5 students for each) focus group interviews, as not all students might feel comfortable to join in on-site interviews. We selected students based on having a similar number of representatives from each of six faculties of Maastricht University, which also means they receive education in different buildings. The students, who were not selected for the focus group interviews, received a rejection email, and were asked the reasons to follow and not to follow the COVID-19-regulations of the university (Supplementary materials can be found at <https://osf.io/fzep9/>, see Appendix 1). All students who participated received a 10-euro worth incentive for their participation.

In order to get an outsider's perspective on students' adherence behavior, we also interviewed corona-stewards and security/crowd-control officials who were active in the university buildings and were trained to monitor the adherence of personnel and students to the guidelines of the university. Corona-stewards are either students or personnel. They wear an orange vest for identification and warn students and staff members if they spot guideline deviant behavior. Security/ crowd-control officials are professionals hired by an outside agency. They are recognizable by their uniform and

enforce students to follow the 1.5 m distancing guideline when large groups entered or left a lecture hall. Interviewees were recruited through their employers. Ten stewards were invited to 2 online focus group interviews and 5 security people for a separate online interview. We selected stewards/security from all different faculties/ buildings; starting vs. experienced; female and male; and of different ages.

In the end, a total of 33 (of 48) students (23 females and 10 males) participated in on-site and online focus group interviews (9 no-shows, and 6 last-minute cancellations because of mild cold symptoms). Twenty students attended on-site focus groups, and 13 students participated in online sessions, from six faculties: Health, Medicine and Life Sciences ($n = 6$); Psychology and Neuroscience ($n = 3$); Law ($n = 5$); Business and Economics ($n = 5$); Arts and Social Sciences ($n = 4$); Science and Engineering ($n = 10$). Five students, who sent additional responses via email, were from Psychology and Neuroscience ($n = 1$), Arts and Social Sciences ($n = 1$), Law ($n = 2$), and Science and Engineering ($n = 1$). Moreover, of 10 invited stewards, 1 male and 7 females (one of them was 73 years and for others, the age range was between 20 to 26) participated in the interviews (1 no-show and 1 last-minute cancellation). There were only 2 male security officials who could attend the study at the selected date/time.

Design and Procedure

Semi-structured focus group interviews were conducted with students. Each focus group interview was moderated by two researchers (facilitator and note-taker): the first two on-site and two online sessions were moderated by GtH and TV, the latter two on-site and two online sessions were conducted by FS and TV. On-site focus group interviews were held on September 9 and 10; online sessions were held via ZOOM on September 22 and 23, 2020. Focus group interviews lasted 1–1.5 hours and were conducted in English since Maastricht University has a large international staff and student population. All sessions were recorded with the consent of the participants prior to the start of the interviews. An information letter and consent form were provided before the focus group interviews and signed consent forms were collected.

During the focus group interviews, an interview guide was used to structure the conversation. The university's corona protocol, i.e., keeping 1.5 m-distance; staying at home/getting tested; and wearing facemasks (at that time not mandatory), was discussed to explore students' opinions/perceptions regarding these behaviors by comparing situations and behaviors inside and outside the university. Also, barriers and facilitators and communications about those regulations were addressed. After four on-site focus group interviews, the sessions were evaluated and, due to data saturation,

the focus also shifted to different aspects (e.g., stress, online & on-site education, etc.) and details (e.g., do you feel comfortable asking people to keep their distance, are you afraid of getting COVID-19). In the online sessions, we also focused on the psychological and social aspects of the COVID-19 crisis and education in times of COVID-19, as these topics were brought up by students during the on-site focus group interviews. The full interview guide can be found in the supplementary materials, Appendix 2.

Semi-structured focus group interviews with stewards took place on September 30, and October 1, and with security on October 5, 2020. We conducted two online focus group interviews with corona-stewards, moderated by FS and TV, one individual interview with one steward due to the language restrictions (in Dutch and moderated by GK) and one online focus group interview with security/crowd-control (in Dutch and moderated by IM). Focus group interviews with stewards were in English and lasted approximately 1.5 hours. Topics of discussions included their observations on the students' (non)compliance behaviors with UM COVID-protocol and their experiences with students.

Data Analysis

A combination of inductive and deductive thematic analysis was conducted (Braun & Clarke, 2006; Fereday & Muir-Cochrane, 2006). We firstly aimed to inductively identify various patterns in students' responses and later on, deductively validating these themes to the theories on health-behavior mentioned below (Vaismoradi et al., 2013).

Inductive Thematic Analysis

The focus group interviews with students were summarized in writing (TV, GtH, and FS) and quotes were transcribed verbatim (TV). After a thorough reading of the summaries, an inductive, data-driven analysis was independently conducted by two of the authors (GK & TV) to generate the themes. The final themes were confirmed by consensus.

Deductive Thematic Analysis

Based on the following theories, themes were rechecked deductively for determinants and salient beliefs of the students regarding the regulations and behind their (non) adherence behavior. The final themes were confirmed by consensus. Behavior-oriented theories help intervention developers by explaining health-behavior (Bartholomew-Eldredge et al., 2016). Several theories guided the deductive thematic analysis: the Theory of Planned Behavior (TPB) (Ajzen, 2011; the Reasoned Action Approach,

Fishbein & Ajzen, 2010) postulate that people's behaviors are determined by their intentions to engage in that behavior, and intention is influenced by (1) attitude, which is people's perception regarding the positive or negative consequences of performing a behavior; (2) perceived norm, which is people's perception of others' (dis)approval for performing a behavior, or people's perception of significant others' behavior; and (3) perceived behavioral control (or self-efficacy), which is people's perception of having required skills to perform a certain behavior. Those three determinants consist, in turn, of underlying beliefs that indicate the content of those skills/barriers, norms and consequences. Protection Motivation Theory (PMT) argues that one's response to a health threat is influenced by (1) threat appraisal, one's evaluations of severity of the threat and one's perceptions of susceptibility to the threat, and (2) coping appraisal, one's expectation of whether executing a response will lead a change (response efficacy) and one's perceived ability to execute this response successfully (self-efficacy). Threat and coping appraisals together lead to protection motivation, which is one's intention to execute the recommendations in response to a health threat (Milne et al., 2000; Norman et al., 2005; Peters et al., 2013; Rogers, 1975; Ruiter et al., 2014). Moreover, theories of automatic behavior and habits claim that these behaviors are external cue dependent and unconscious, so do not require the use of many cognitive resources (Verplanken, 2018).

Data Analysis of the Focus Group Interviews With Stewards/Security

The focus group interviews with stewards/security people were also summarized in writing by TV, FS, GK, and IM. As the main aim of these interviews was to gather more insights regarding students' (non)adherence to the university COVID-19-guidelines, we did not analyze these interviews in detail, but checked the texts for any additional findings.

Results

In this study, we aimed to explore students' adherence and reasons behind their (non) adherence to COVID-19-regulations within a university. The final list of themes included: *general university COVID-19-guidelines, keeping distance, staying at home/getting tested, wearing a facemask, education and social aspects, and communications within the university* (see Table 2.1 for themes).

Table 2.1: Determinants and underlying beliefs of students' adherence to the regulations

	Inductive	Deductive
Opinions about the university's COVID-19 regulations in general	not afraid of contracting COVID-19	Risk Perception Belief
	feeling safe inside the university	
	susceptible to contract COVID-19	
	the physical and social consequences of contracting COVID-19	
	makes it difficult to meet and connect with other students	Attitudinal Belief
	well-organized	
	guidelines are irrelevant for our generation	
	worrying about my future	
	trust in other people's adherence behavior	
	telling people around me to adhere to the guidelines	
Keeping distance	staff members remind to follow the regulations	Normative Belief
	difficult to adhere to	Control Belief
	information about the guidelines is confusing	
	outside the university buildings	
	do not want to get sick	Risk Perception Belief
	want to protect parents and grandparents (vulnerable)	
	do not want to spread the virus to others	Attitudinal Belief
	concerned for public health	
	meeting social contacts	
	while contacting with teacher or tutor	
when you are new and seek new friends		
Getting tested/ staying at home	with close friends	Control Belief
	in student houses or at home	
	difficult to tell other people to keep 1.5m distance from me	
	not enough space in the buildings to keep distance	
	facilities within the university	
	outside the university buildings	
	when there is no reminder	Habit
	when you forget	
	scared of missing lectures	Attitudinal Belief
	taking care of oneself	
responsibility towards others		
scared of testing positive		
Wearing a face mask	financial reasons	Control Belief
	difficulty to detect or differentiate the symptoms of COVID-19 from other diseases	
	while wearing my facemask, keeping 1.5m distance is less needed/relevant	Risk Perception Belief
	feeling safer while wearing a facemask	Attitudinal Belief

Opinions About the University's COVID-19 Regulations in General

Most students viewed the guidelines and infrastructure created in the university buildings as well-organized (e.g., signs on the floor, the walking routes, 1.5 m apart tables and chairs, and the presence of stewards). Some students found it easy to follow the guidelines. However, other students stated that the information about the regulations that they received from the university is confusing and they have difficulties adhering to the guidelines. Also, students, especially first-years, indicated that due to the regulations, it is difficult to make new friends or meet with fellow students to socialize or study. For instance, one student stated:

“At the university, they made it very difficult to socialize there, that is, you scan in and go to your class and scan out as soon as it is done. So, there you don't really interact with anyone and your tutorials are really small groups.” (student no. 22)

From a different perspective, another student argued:

“For me, it's nearly impossible to have a social life with taking the measurements into account because everyone I met before the corona crisis, I'm still meeting and it's just if someone feels cold or something, they let themselves tested and they say that to each other but when you meet other people, and they are your friends... Yeah. For me, it is impossible to keep the distance and I still have a social life and I want to continue having that. And it didn't really change during the crisis.” (student no. 26)

When asked about their experiences within and outside of the university, students indicated that within the university, they more easily follow the guidelines, and feel safe. Whereas outside, they found it difficult to keep a distance from others, especially in the supermarket and city center. One student stated:

“When I am at the university – yes because it is quite empty and they are doing a really good job by making sure that there is only limited amount of people in the building, so it is really easy to stick to the guidelines, but in Maastricht overall, I would say it is not possible. You can be really careful, but as soon as you go to the supermarket, no one else cares.” (student no. 22)

In addition, some students mentioned that they are also not as careful outside as inside the university buildings regarding following the rules, e.g.:

“At least what I have experienced when we are at the university, we are a bit more careful because we know that we are in this institution and because we

see the university staff that is also trying to remind us constantly to keep the distance, but then there are just so many opportunities outside the university to meet up with people. We are trying to keep a distance. Somehow it always ends up not happening at some point. We are either crossing each other or we are staying too close to each other.” (student no. 28)

Additional beliefs arose from the discussions. First, some students mentioned that they are afraid of contracting COVID-19 and infecting other people, so they are adhering to the rules. On the other hand, some students stated that they are not afraid of getting COVID-19 because they are young. One student argued:

“Group mentality is that we accept the consequences. We know we are responsible for ourselves. We know we might get the virus.” (student no. 4)

Second, regarding telling other people to follow the guidelines, some students deemed it challenging and instead would prefer someone with authority to do that. Also, one student mentioned:

“If people aren’t going to respect that, that’s their problem and you cannot really do policing to other people’s lives.” (student no. 22)

Third, students revealed that staff remind students to follow the regulations. Fourth, one student shared her concerns pertaining trusting other people’s adherence behavior. Lastly, some students said that they worry about their future, such as finding an internship or a job, as there are less opportunities for placement and to meet staff and make a network.

Keeping Distance

Even though students support the 1.5 m-distance-from-others guideline, most students found it difficult with reasons as *“with close friends; when you are new and seek new friends; outside of university buildings; in student houses or at home; while contacting with teacher or tutor; when there is no reminder; when you forget; when others don’t keep their distance.”* For example, one student mentioned:

“Like when you are inside the building, you have always these reminders of keeping your distance, but when you are back into the streets or just hang out with your friends, you don’t have all these signs that remind you keep your distance. So automatically by instinct, you just go back together. It is also socially kind of hard to even with your friends keep one and a half meters.... so yeah just by instinct you just go back to together.” (student no. 31)

Some students stated that there is a lack of space in some university buildings to maintain a 1.5 m-distance. For instance, one student stated:

“There are certain things that individuals simply can’t control. It is unlikely that all students and members of staff at the university keep a 1.5 m-distance at all times: sometimes the rooms in which we have tutorials are very limited in terms of space for that to be possible, especially at the beginning and ending of sessions.” (student no. 36)

In one of the focus group interviews, students discussed their negative experiences within the university library regarding adhering to the regulations. One student argued that at the library, especially during the opening and closing hours, there are too many people at the same spot and the stairs are too narrow. Moreover, students talked about their struggles to tell others to keep 1.5 m-distance. Some students found it hard to stand up their own opinion and to warn their friends to keep distance.

Reasons behind students' keeping-distance behavior are *“do not want to get sick; do not want to spread the virus to others; want to protect parents and grandparents; concerned for public health.”* One student stated:

“I like to keep the distance because I do not want to get Corona in the first place, but I am not worried about me too much because I am young and of good health. I like to keep the distance more because I want to protect my parents or grandparents, who are more vulnerable, from catching the virus.” (student no. 38)

On the contrary, one of the most common reasons why students do not adhere to or having difficulties adhering to keeping 1.5 m-distance regulation relates to the social aspect. Some students conveyed that they want to sit together with their friends, have drinks and go their friends' places, so to socialize; even though they normally try to keep distance, when they are together with their friends, distancing becomes impossible to adhere to.

Getting Tested/Staying at Home

There was a wide range of beliefs for (non)adherence to the regulation of staying at home and getting tested when having symptoms. Some students thought that getting tested is easy while some others found it difficult. The reasons behind not getting tested/staying at home included *“financial reasons; scared of missing lectures; scared of testing positive.”* On the other hand, the reasons for getting tested/staying at home were

“responsibility towards others; taking care of oneself.” For instance, in case of having symptoms, one student stated:

“If I would not feel well, I would stay home immediately and get tested. The most important reason is not to form a risk for my family and other people. I actually had a cold in April for about a week and during that time and a period after, I didn’t go anywhere and did my grocery shopping online.” (student no. 35)

Students mentioned that they struggle to detect or differentiate the symptoms of COVID-19 from other diseases or a cold. If they have sneeze or cough that might as well be an allergy, or in case they have headache, understanding whether it is COVID-19 or not is difficult. However, some students thought that in every case, they should stay at home even if they have mild symptoms:

“There is lack of responsibility because if you are feeling sick, you shouldn’t go to school, but on the other part, I get that it is also difficult to relate every symptom to coronavirus. But of course, if I feel like that I wouldn’t go to school.” (student no. 23)

Wearing a Facemask

At the time of focus group interviews (September 2020), facemasks were not compulsory (since October 2020, students and staff are obliged to wear facemasks inside the university, when walking or standing). Although students mostly argued that facemasks are important, they were content to have a choice to wear masks or not. On the other hand, if it would become mandatory at the university, they would not see that as a problem. Some students mentioned that they are wearing facemasks at the university and/or while doing grocery shopping. Also, some students stated that when other people wear facemasks, they feel safer. There was a discussion regarding the impact of wearing facemasks on the adherence to the other measures. Some students conveyed that it enhances distancing behavior because when they see people who are wearing facemasks, that reminds them to keep distance. Nevertheless, others thought that it negatively affects distancing behavior as people come closer because they think that wearing a facemask protects them from getting infected.

Social and Psychological Aspects and Education During COVID-19

Due to the online lectures and COVID-19 measures, almost all students stated that they find it difficult to make new friends online and meet with people at the university.

They claimed that they had a chance to socialize with their potential friends before and after the lectures or during the breaks before COVID-19. However, now, since teaching is mostly online or because of the regulations at the university, they could not meet with fellow students. Therefore, due to the lack of social support, they felt that they experienced more stress.

According to students, the transition from onsite to hybrid/online education was very prompt, and it worked well, albeit with some small problems. All students preferred on-campus education as opposed to online lectures. They found the online education environment more challenging, stressful, and tiring. Some students stated that they are required to spend long hours in front of a screen during the online lectures, which might be more difficult for students who have concentration problems. Also, they conveyed that some students might not have a suitable learning environment at home or in student houses. Furthermore, during the online lectures and tutorials, they found it hard to engage and ask questions.

Communications Within the University

Students argued that updates by email are helpful yet too long, so they generally skip them without reading. They would prefer short and clear emails and transparent communication. They stated that they would like the news communicated very fast, as the press conferences are in Dutch and international students need translations to be informed about the new regulations. Most students found the guidelines and visuals within the university buildings clear and informative.

Additional Information from Stewards and Crowd Control

Stewards conveyed that students mostly give a positive response when they approach them to keep their distance. They observed that in some locations (e.g., because of the infrastructure) and situations (e.g., before and after the lectures), compliance decreases. They mentioned that students are trying to stick to the rules, but sometimes they forget to do so (e.g., disinfecting tables after the lectures or using hand sanitizer upon entering the buildings). One interesting finding was that stewards/ security stated that in comparison with students, staff members are less compliant with COVID-19 measures of the university and less willing to adapt their behaviors.

Discussion

In this project, our final goal is to create an intervention to minimize the spread of the coronavirus by enhancing students' compliance with COVID-19-regulations of the university. The development of an effective behavior change intervention requires an understanding of the target groups' behavior and determinants of those behaviors (Bartholomew-Eldredge et al., 2016; Kok et al., 2016). Therefore, we examined (non) adherence behaviors of students to the regulations and the determinants behind those behaviors.

The findings of our study revealed that most of the participants have positive attitudes towards the measures. In addition to expressing their willingness to adhere to COVID-19-guidelines, they also mentioned facilitators and barriers for their (non)compliance. They thought that the university's COVID-19-guidelines and the established infrastructure mostly serve as a buffer against infection. However, some students also stated that they have difficulties in keeping distance where there is not enough space (e.g., check-in/out and stairs at the library). In addition, students mentioned that sometimes keeping distance is not up to them because others do not keep their distance. In such situations, they feel uncomfortable telling others to keep 1.5 m-distance and prefer tutors/teachers or stewards to keep order. Also, almost all students mentioned the social aspect of the guidelines. Even though they want to comply, they also stated that it is difficult to make new friends or meaningful contacts under these circumstances. When they meet with their friends, it becomes impossible to adhere to the guidelines because either they do not care or do not pay attention to keeping distance. Barrett and Cheung (2021) explored the determinants of distancing and hand hygiene behaviors among the UK university students and found that low self-efficacy significantly negatively impacts students' social distancing behavior. Moreover, Beeckman et al. (2020) also demonstrated that among the adult population self-efficacy is one of the determinants of physical distancing behavior. People who adhere to the coronavirus measures reported that they are confident about their skills to comply with the rules. In line with these findings, as students in our study reported that they are having difficulties with keeping distance when together with friends or telling others to keep their distance, being low in self-efficacy might act as a barrier for students' adherence to COVID-19-regulations.

Concerning risk perception beliefs, some students reported that they are not afraid of contracting coronavirus because they are young, so that the consequences might be minimum for themselves. However, some of them added that they are afraid of infecting others with coronavirus. De Bruin and Bennett (2020) found that

people who perceive higher risks of COVID-19 infection show more compliance with preventive behaviors such as physical distancing. Hence, risk perception can be one of the factors that impact students' adherence to the regulations. Also, as studies revealed that perceived norm is an important determinant of compliance with the preventive behaviors (Folmer et al., 2020; Hagger et al., 2020), students' perception of their friends' or tutors/teachers' behavior might be another factor that has an effect on students' preventive behaviors. Moreover, students also stated that sometimes they simply forget to keep 1.5 m-distance from others and fall back into old routines, which is in line with the findings of Hagger et al. (2020).

The limitations of this study include that since the measures constantly change due to the circumstances, people's compliance behavior might also alter. For instance, at the time of the focus group interviews, facemasks were not mandatory. Later, they became mandatory in public places and in shops and buildings where people come together. However, although new developments happen(ed) every day, the nature of the specific regulations in this study (i.e., distancing, testing and isolating) remained unchanged throughout the period of data collection. Another limitation is that the results were based on self-reports of a limited number of students, but steward/security data confirmed the findings. On the other hand, although we did not aim to sample to saturation, the interviews and observations produced little change to the codebook after the initial on-site focus group interviews.

Conclusion

The main findings of the interviews showed that most students were in favor of the COVID-19-regulations, if not for themselves than at least to protect the vulnerable. At the same time, they found adhering to these rules difficult in some situations. On the one hand, the infrastructure and university staff and surveillance personnel were deemed helpful for students' adherence to the guidelines. On the other hand, the factors that hindered adherence behaviors of students included the physical environment; the need to socialize; being low in self-efficacy to correct others; forgetting; no perceived threat, and/or low vulnerability such as being young. Based on the information gathered during the interviews, (low) self-efficacy and (low) risk perception might be the most relevant determinants behind the (non)adherence behaviors of students. Also, perceived norms and habits might impact students' compliance with preventive behaviors. The information gathered in this study will inform the following quantitative survey study, as the next step to identify the most relevant determinants of students'

(non)adherence behaviors to the guidelines, resulting in concrete ideas for an intervention to promote COVID-19-preventive behaviors.

References

- Adhikari, S. P., Meng, S., Wu, Y. J., Mao, Y. P., Ye, R. X., Wang, Q. Z., ... Zhou, H. (2020). Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: a scoping review. *Infectious Diseases of Poverty*, 9(1), 1–12. <https://doi.org/10.1186/s40249-020-00646-x>
- Ajzen, I. (2011). The theory of planned behavior: Reactions and reflections. *Psychology & Health*, 26(9), 1113–1127. <https://doi.org/10.1080/08870446.2011.613995>
- Barrett, C., & Cheung, K. L. (2021). Knowledge, socio-cognitive perceptions and the practice of hand hygiene and social distancing during the COVID-19 pandemic: A cross-sectional study of UK university students. *BMC Public Health*, 21(1), 1–18. <https://doi.org/10.1186/s12889-021-10461-0>
- Bartholomew Eldredge, L. K., Markham, C. M., Ruiters, R. A. C., Fernández, M. E., Kok, G., & Parcel, G. S. (2016). *Planning health promotion programs: an intervention mapping approach*. John Wiley & Sons.
- Beeckman, M., De Paepe, A., Van Alboom, M., Maes, S., Wauters, A., Baert, F., ... Poppe, L. (2020). Adherence to the Physical Distancing Measures during the COVID-19 Pandemic: A HAPA-Based Perspective. *Applied Psychology: Health and Well-Being*, 12(4), 1224–1243. <https://doi.org/10.1111/aphw.12242>
- Bloor, M. (Ed.). (2001). *Focus groups in social research*. Sage. <https://doi.org/10.4135/9781849209175>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- De Bruin, W. B., & Bennett, D. (2020). Relationships Between Initial COVID-19 Risk Perceptions and Protective Health Behaviors: A National Survey. *American Journal of Preventive Medicine*. <https://doi.org/10.1016/j.amepre.2020.05.001>
- Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative Methods*, 5(1), 80–92. <https://doi.org/10.1177/160940690600500107>
- Fernandez, M. E., Ruiters, R. A., Markham, C. M., & Kok, G. (2019). Theory- and evidence-based health promotion program planning: intervention mapping. *Frontiers in Public Health*, 7, 209. <https://doi.org/10.3389/fpubh.2019.00209>
- Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. New York: Taylor & Francis Group. <https://doi.org/10.4324/9780203838020>
- Folmer, C. R., Kuiper, M., Olthuis, E., Kooistra, E. B., de Bruijn, A. L., Brownlee, M., ... van Rooij, B. (2020). Sustaining Compliance with Covid-19 Mitigation Measures? Understanding Distancing Behavior in the Netherlands during June 2020.
- Hagger, M. S., Smith, S. R., Keech, J. J., Moyers, S. A., & Hamilton, K. (2020). Predicting Social Distancing Intention and Behavior During the COVID-19 Pandemic: An Integrated Social Cognition Model. *Annals of Behavioral Medicine*, 54(10), 713–727. <https://doi.org/10.1093/abm/kaa073>
- Kok, G., Gottlieb, N. H., Peters, G.-J. Y., Mullen, P. D., Parcel, G. S., Ruiters, R. A. C., Fernández, M. E., Markham, C., & Bartholomew, L. K. (2016). A taxonomy of behavior change methods: An Intervention Mapping approach. *Health Psychology Review*, 10(3), 297–312. <https://doi.org/10.1080/17437199.2015.1077155>
- Krueger, R. A., & Casey, M. A. (2014). *Focus groups: A practical guide for applied research*. Thousand Oaks, California, United States: Sage publications.

- Milne, S., Sheeran, P., & Orbell, S. (2000). Prediction and Intervention in Health-Related Behavior: A Meta-Analytic Review of Protection Motivation Theory. *Journal of Applied Social Psychology*, 30(1), 106–143. <https://doi.org/10.1111/j.1559-1816.2000.tb02308.x>
- National Institute for Public Health and the Environment (RIVM). (2020). *Patient with novel coronavirus COVID-19 in the Netherlands*. <https://www.rivm.nl/en/news/patient-with-novel-coronavirus-covid-19-in-netherlands> (accessed November 2020).
- Norman, P., Boer, H., & Seydel, E. R. (2005). Protection motivation theory. *Predicting Health Behaviour*, 81, 126.
- Peters, G. J. Y., Ruiter, R. A. C., & Kok, G. (2013). Threatening communication: a critical re-analysis and a revised meta-analytic test of fear appeal theory. *Health Psychology Review*, 7(sup1), S8–S31. <https://doi.org/10.1080/17437199.2012.703527>
- Rijksoverheid. (2020a). *Aanvullende maatregelen onderwijs, horeca, sport*. <https://www.rijksoverheid.nl/actueel/nieuws/2020/03/15/aanvullende-maatregelen-onderwijs-horeca-sport> (accessed November 2020).
- Rijksoverheid. (2020b). *Coronavirus dashboard*. <https://coronadashboard.government.nl/landelijk/reproductiegetal> (accessed November 2020).
- Rogers, R. W. (1975). A Protection Motivation Theory of Fear Appeals and Attitude Change. *The Journal of Psychology*, 91(1), 93–114. <https://doi.org/10.1080/00223980.1975.9915803>
- Ruiter, R. A. C., Kessels, L. T. E., Peters, G.-J. Y., & Kok, G. (2014). Sixty years of fear appeal research: Current state of the evidence. *International Journal of Psychology*, 49, 63–70. <https://doi.org/10.1002/ijop.12042>
- Sahu, P. (2020). Closure of universities due to Coronavirus Disease 2019 (COVID-19): impact on education and mental health of students and academic staff. *Cureus*, 12(4). <https://doi.org/10.7759/cureus.7541>
- Singhal, T. (2020). A review of coronavirus disease-2019 (COVID-19). *The Indian Journal of Pediatrics*, 1–6. DOI: <https://doi.org/10.1007/s12098-020-03263-6>
- Toquero, C. M. (2020). Challenges and Opportunities for Higher Education Amid the COVID-19 Pandemic: The Philippine Context. *Pedagogical Research*, 5(4). <https://doi.org/10.29333/pr/7947>
- Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing & Health Sciences*, 15(3), 398–405. <https://doi.org/10.1111/nhs.12048>
- Verplanken, B. (Ed.) (2018). *The psychology of habit: Theory, mechanisms, change, and contexts*. Springer. <https://doi.org/10.1007/978-3-319-97529-0>
- World Health Organization. (2020a). *Coronavirus disease 2019 (COVID-19): situation report*, 52. <https://apps.who.int/iris/handle/10665/331476> (accessed November 2020).
- World Health Organization. (2020b). *Coronavirus disease 2019 (COVID-19): situation report*, 72. <https://apps.who.int/iris/bitstream/handle/10665/331685/nCoVsitrep01Apr2020-eng.pdf> (accessed November 2020).
- Yerkes, M. A., André, S. C., Besamusca, J. W., Kruyen, P. M., Remery, C. L., van der Zwan, R., ... Geurts, S. A. (2020). 'Intelligent' lockdown, intelligent effects? Results from a survey on gender (in) equality in paid work, the division of childcare and household work, and quality of life among parents in the Netherlands during the Covid-19 lockdown. *PLoS One*, 15(11), e0242249. <https://doi.org/10.1371/journal.pone.0242249>

Chapter 3

Selection of Determinants of Students' Adherence to COVID-19 Guidelines and Translation Into a Brief Intervention

This chapter is based on: Varol, T., Crutzen, R., Schneider, F., Mesters, I., Ruiter, R. A. C., Kok, G., & Ten Hoor, G. A. (2021). Selection of determinants of students' adherence to COVID-19 guidelines and translation into a brief intervention. *Acta Psychologica*, 219, 103400. <https://doi.org/10.1016/j.actpsy.2021.103400>

Abstract

Background: When reopening universities in times of COVID-19, students still have to adhere to COVID-19 behavioral guidelines. We explored what behavioral determinants (and underlying beliefs) related to the adherence to guidelines are both relevant and changeable, as input for future interventions.

Methods: A cross-sectional online survey was conducted (Oct–Nov 2020), identifying behavioral determinants (and underlying beliefs) of university students' adherence to COVID-19-guidelines, including keeping 1.5 m distance, getting tested, and isolating ($N = 255$).

Results: Attitude, perceived norm, self-efficacy, and several beliefs (e.g., risk perception beliefs 'I am not afraid because I am young' [$r = -0.33$; $p < .001$]; attitudinal beliefs, e.g., 'I feel responsible for telling people to adhere to guidelines' [$r = 0.37$; $p < .001$]; self-efficacy beliefs, e.g., 'COVID-19-prevention guidelines are difficult to adhere to' [$r = -0.30$; $p < .001$]) were associated with intention to adhere to guidelines, *and* for those beliefs there was room for improvement, making them suitable as possible intervention targets.

Conclusions: Students mostly adhere to COVID-19 guidelines, but there is room for improvement. Interventions need to enhance students' adherence behavior by targeting the most relevant determinants as identified in this study. Based on these findings, a small intervention was introduced targeting the determinants of students' adherence to guidelines.

Keywords: COVID-19; university students; adherence; determinants; guidelines; intervention

Introduction

Since the first identification of the coronavirus disease 2019 (COVID- 19), almost all countries around the world took preventive measures. Person-to-person transmission of the virus was established as the source of infection (Adhikari et al., 2020; Rothan & Byrareddy, 2020; Shereen et al., 2020), and therefore behavioral measures such as social distancing, quarantining and wearing facemasks were taken (Fauci et al., 2020; Van Bavel et al., 2020). Another measure was the closure of schools (ranging from primary schools to universities) to further slow the spread of the virus but with negative consequences for students' psychosocial wellbeing and educational development (Auger et al., 2020; Head et al., 2020; Petretto et al., 2020; Ziauddeen et al., 2020). Moreover, even though the vaccination has started, authorities continue to suggest people to follow the preventive measures as long as the vaccination rate has not reached a critical threshold for group immunity (WHO, 2020). Therefore, when reopening universities, university administrators need to develop and implement theory- and evidence-based interventions to enable students' safety within university facilities.

For intervention development, it is important to examine an individuals' relevant behaviors including the determinants and underlying beliefs of those behaviors (Bartholomew Eldredge et al., 2016; Fernandez et al., 2019; Peters, 2014). In this specific case, the focus was on students' behaviors and determinants. The role of the relevant stakeholders was already realized by the facilitation of preventive behaviors such as providing facilities for disinfecting hands, arrows for walking directions, instructions for taking a test, et cetera. In the present study, we answer the question why students perform specific risk behaviors and what motivates them to replace these behaviors with more safe behaviors. The identified belief structures, in turn, will serve as the target points for future interventions (Kok, 2014).

Theories About Behavioral Determinants and Their Underlying Beliefs

Theories behind this study include the Reasoned Action Approach (Fishbein & Ajzen, 2010; Theory of Planned Behavior, Ajzen, 2011), which postulates that intention is the most proximal determinant of behavior. Intention is influenced by three other determinants with underlying beliefs: (a) attitude, people's evaluation of consequences and experiences when performing the behavior; (b) perceived norm, people's beliefs that important others would (dis)approve of their performing the behavior (injunctive norm) and their beliefs that others like themselves do (or do not) perform the behavior (descriptive norm); (c) perceived behavioral control (comparable to: self-efficacy), people's beliefs about the degree to which they are capable of, or have control over,

carrying out the behavior. Protection Motivation Theory (Maddux & Rogers, 1983) states that people respond to a threat based on its (a) perceived severity and (b) perceived susceptibility, (c) the availability of an adequate coping response, and (d) their self-efficacy to perform the behavior. Next to theories about reasoned behavior, theories on automatic behaviors and habits, which are context-dependent automatic behaviors (Wood & R nger, 2016), can additionally explain behavior, for example why it is difficult to keep distance from close friends with whom you normally might also be physically close with.

Selecting the Most Relevant Determinants by Employing the CIBER Approach

After mapping the determinants/beliefs behind students' adherence behavior, the next step to create an intervention is to select the most relevant targets to intervene upon. To develop our intervention, we used the Confidence Interval-Based Estimation of Relevance (CIBER, Peters & Crutzen, 2018) approach, which enables intervention developers to select relevant determinants/beliefs based on 1) association between the behavior/intention and other determinants/beliefs and 2) room for improvement of each determinant/belief based on its univariate distribution. Although one determinant/belief might have a high correlation with intention/behavior, it still might not be a good target to incorporate in the intervention due to the less to no room for improvement. By room for improvement, we mean that, for instance, if people already show a high self-efficacy to adhere to the rules, this determinant cannot be substantially improved.

The Current Study

In this study, we aimed to identify the relevant and changeable determinants and underlying beliefs of students' adherence to COVID-19- guidelines, thereby quantifying the findings of our earlier qualitative study (Chapter 2). We use insights into the relevance of these determinants/beliefs in the intervention to be developed. Based on our qualitative findings, the behaviors that we focus on in this study are 1) adherence to general COVID-19 guidelines, and the two most important specific guidelines: 2) keeping at least 1.5 m distance, and 3) staying at home and getting tested when having symptoms. Although wearing a facemask inside facilities is also identified as an important measure, this was introduced as part of the university guidelines after the start of this study. Although we anticipated this by adding some belief-questions in our questionnaire, we did not measure intention or behavior, and therefore those outcomes are not reported here. Also washing/disinfecting hands is identified as

important behavior, but compliance was already high, and therefore seen as having a lower need to change.

Methods

Strengthening the reporting of observational studies in epidemiology (STROBE) guidelines providing guidance to the researchers to report their studies were followed to report this observational study (Von Elm et al., 2007). In order to maximize scrutiny, foster accurate replication, and facilitate future data syntheses (e.g., meta-analyses) (Peters et al., 2012), supplementary materials (e.g., questionnaire) are available at the Open Science Framework: <https://osf.io/fzep9/>.

Participants and Recruitment

Participants were university students who had the intention to visit the Maastricht University buildings “within the next two months”, as all questions were focused on that period (students filled out the online questionnaire between 26 October and 9 November 2020). They were recruited through Flycatcher (2021) (a certified online panel and operator of the existing representative student panel of Maastricht University (UM) – see also [https://www.flycatcher.eu/en/Home/Over Ons](https://www.flycatcher.eu/en/Home/Over%20Ons)). This panel represented students from all Maastricht University faculties and programs. All students who are a member of the UM student panel were invited to participate in the online survey. As compensation for participating in a questionnaire through this panel, students receive a small incentive each time they participate in research (10 euro for 900 points and this survey was 150 points). This study was approved by the Ethics Review Committee Psychology & Neuroscience, Maastricht University, ref. 188_10_02_2018_S59. All participants consented to participate in the study.

Design and Procedures

Data collection period was between October 26 and November 9, 2020. In this period, the Dutch government installed an “intelligent lockdown” during which higher education institutions had the option to offer hybrid education in which students could choose between attending classes on-site within the university buildings (with a limited number of students being allowed in a time slot) or online. Students were invited to the study via e-mail, which included a hyperlink. When clicking to this link, they were directed to the survey which starts with the information about the

questionnaire as well as a question whether they consent to participate in this study. Students who indicated that they do not want to consent were directed to the end of the survey. Students who consented received the questionnaire in block-random order in which the four categories were randomized over four orders (using a Latin-square design, i.e. (1) ABCD; (2) DCBA; (3) BDAC; (4) CADB whereby A = general ÜM COVID-19-guidelines; B = keeping distance; C = testing and isolating, and D = demographics/additional information – see also Measurements). Note that A is about behaviors specific to the university setting and B and C are more overarching because also applicable outside the university setting. No questions could be skipped, but participants were free to stop at any time. The language used in the questionnaire was English.

Measurements

In our earlier qualitative study (Chapter 2), we gathered information on students' determinants and underlying beliefs regarding (non)adherence to the university's COVID-19-guidelines. Based on these findings and theories of reasoned and automatic behavior, we formulated our survey questionnaire. The items consisted of questions regarding 1) adherence to general COVID-19-guidelines of the university (keeping 1.5 m distance, disinfecting hands, refraining handshake, avoiding crowds and getting tested/isolating), 2) keeping 1.5 m distance, and 3) getting tested/isolating when having symptoms, and 4) demographics (i.e., gender, age, study-year, and faculty). The major be comparable to the whole student panel (as we used the student panel for data collection). Lastly, some questions on education (hybrid vs. on-site and online vs. hybrid), social and mental health, and physical activity in times of COVID-19 were included, but these are not reported here as they are beyond the scope of this chapter (see Supplementary file 1 for the complete questionnaire; see Supplementary file 2 for results). Determinants were measured based on the theories mentioned earlier (Ajzen, 2011; Fishbein & Ajzen, 2010; Maddux & Rogers, 1983; Wood & R nger, 2016) and the content of the underlying belief items were created based on the information elicited in the interviews with students.

Adherence to COVID-19-Guidelines of the University

After introducing the general COVID-19 prevention guidelines in university buildings, students' self-reported adherence to COVID-19- guidelines of the university (9 items) and intention to adhere to guidelines for the next two months (6 items) were measured. Those items related to 1) keeping 1.5 m distance from other people, 2) disinfecting

hands upon entering the university building, 3) refrain from shaking hands, 4) avoiding crowds or situations where 1.5 m distance was not possible, 5) staying at home, and getting tested. To calculate a general adherence intention, we combined those intentions ($\Omega = 0.74$) to one general adherence intention score. Please note that the university rule to wear a facemask was installed after we conducted this questionnaire, and therefore this intention was not included in this composite score. Additional to adherence behavior and intention, attitude (2 items; bad-good; unpleasant-pleasant), perceived norm (2 items; e.g., “*Most people like me always adhere to the general university COVID-19 prevention guidelines*”), self-efficacy (2 items; e.g., “*I am confident that if I want to, I can adhere to the general university COVID-19 prevention guidelines*”), risk perception beliefs (4 items, e.g., “*I am not afraid of contracting COVID-19 because I am young*”), attitudinal beliefs (7 items; e.g., “*The general university COVID-19 prevention guidelines are irrelevant for our generation*”), perceived norm belief (1 item, i.e., “*My teachers/tutors at UM care about the general UM COVID-19 prevention guidelines*”), and self-efficacy beliefs (2 items; e.g., “*The general UM COVID-19 prevention guidelines are difficult to adhere to*”) were measured. All items were measured on a 7-point Likert scale (see Supplementary file 1 for the full questionnaire).

Keeping 1.5 m Distance

Keeping 1.5 m distance intention was measured with three items: For the next two months I intend to: (a) keep 1.5 m distance from the people close to me, (b) keep 1.5 m distance from all other people, and (c) avoid crowds. Additionally, attitude (2 items), perceived norm (2 items), self-efficacy (2 items), risk perception (1 item), risk perception belief (1 item), attitudinal beliefs (6 items), perceived norm belief (1 item), self-efficacy beliefs (7 items) and habits (a 6-item scale, $\Omega = 0.83$; e.g., “*Coming closer than 1.5m to other people is something that ... I may do without thinking*”; for the use of Ω , see Crutzen & Peters, 2017). We provided Ω scores where necessary. If we did not indicate Ω , that means that each item was separately assessed in the CIBER analysis since each relevant item is likely to be a target for an intervention. All items used similar formulations as the items as described above (see Adherence to COVID-19-guidelines of the university) and were measured on a 7-point Likert scale.

Testing and Isolating

To measure testing and isolating behavior, one measure of intention was included (i.e., “*For the next two months, I intend to ... get tested and stay at home as a precaution until I have the test results if I have cold-related symptoms or a high temperature (fever)*”). Additionally, attitude (2 items), perceived norm (2 items), self-efficacy (2 items), risk

perception (1 item), attitudinal beliefs (6 items), and self-efficacy beliefs (2 items) were measured. All items were again similar to the items described above and measured on a 7-point Likert scale.

Data Analysis

IBM SPSS Statistics 26 was used for descriptive analyses, e.g., frequencies, means (M) and standard deviations (SD). Correlations between students' adherence behaviors to guidelines and their intentions to adhere to guidelines, and correlations between intentions and their determinants were analyzed. In our analysis, we did not control for age or gender. Intervening in the university setting did not allow for targeting specific students based on their gender and age. The 'constraints' of the intervention setting consisted of using communication channels within the university and changes in the environment (e.g., providing certain facilities) that affected all students (regardless of their gender and age).

To select the most relevant determinants, i.e., to what extent the determinants were correlated with intention (as most important predictor of behavior), and to what extent there was room for improvement, we used the CIBER approach, which visualizes the data and illustrates the univariate distribution of each item in one panel and the association between behavior/determinant and determinants in another panel (see Figure 3.1; Crutzen et al., 2017; Peters & Crutzen, 2018). It is necessary to combine these two types of analyses when establishing relevance. Assessing the associations of determinants with behavior and/or determinants is important because those determinants that are not associated with behavior and/or more proximal determinants will often be the least likely candidates to intervene upon. The univariate distributions are also important because bimodal distributions may be indicative of subgroups, and strongly skewed distributions have implications for how a determinant should be targeted. For example, if a determinant is positively associated with behavior but left-skewed, most population members already have the desired value (for positively formulated questions), so it should merely be reinforced in an intervention. Conversely, right-skewed positively associated determinants imply a need for change, as most population members do not have the desired value yet. This latter category of determinants would be more viable intervention targets as there is more room for improvement. To create the CIBER plots, we used the 'behaviorchange' R package (Peters, 2021).

Results

A total of 907 students (all UM-student-panel members) were invited to participate, with the prerequisite of having the intention to visit the university in the next two months; 328 students (36.2%) responded to the survey (after removing 57 responses: poor response quality (e.g., consistency of answers, straight lining and completion time) [$n = 2$], drop-out/incomplete questionnaire [$n = 55$]). Among those 328 students, 69 stated they do not intend to visit the university in the next two months and 4 students mentioned they did not visit the university in the past two months, and thereby did not have behavioral data. Hence, 255 students (75.7% female) were included in the data analyses. The mean age of students was 21.0 years ($SD = 2.7$) and 50 students (19.6%) indicated that they are living alone. More detailed background characteristics of the sample are provided in Table 3.1.

Table 3.1: Background characteristics of the sample ($N = 255$)

	<i>N (%)</i>
Students	
Female	193 (75.7%)
Age in years ($M + SD$)	21.0 (2.7)
Study year	
Bachelor year 1	81 (31.8%)
Bachelor year 2	52 (20.4%)
Bachelor year 3	48 (18.8%)
Pre-master	2 (0.8%)
Master year 1	51 (20%)
Master year 2	17 (6.7%)
Master year 3	4 (1.6%)
Faculty*	
FHML	91 (35.7%)
FASoS	28 (11%)
FPN	29 (11.4%)
SBE	39 (15.3%)
FdR	18 (7.1%)
FSE	50 (19.6%)
Living situation	
I live alone	50 (19.6%)
I live with my parent(s)/caretaker(s)	51 (20%)
I live with my partner	20 (7.8%)
I live with people other than the abovementioned	134 (52.5%)

* FHML: Faculty of Health, Medicine and Life Sciences; FASoS: Faculty of Arts and Social Sciences; FPN: Faculty of Psychology and Neuroscience; SBE: School of Business and Economics; FdR: Faculty of Law; FSE: Faculty of Science and Engineering.

Adherence to COVID-19-Guidelines of the University

Students showed high adherence to COVID-19 university guidelines based on self-reported measures. In the past two months, 34.1% (almost) always kept 1.5 m distance from other people ($M = 5.76$; $SD = 1.19$; Mdn (IQR) = 6.00 (5.00 to 7.00)); 24.7% (almost) always avoided situations where one cannot keep 1.5 m distance ($M = 5.29$; $SD = 1.49$; Mdn (IQR) = 5.00 (4.00 to 6.00)), 51.4% (almost) always avoided crowds ($M = 6.13$; $SD = 1.12$; Mdn (IQR) = 7.00 (5.00 to 7.00)), 75.3% (almost) always disinfected their hands upon entering the university buildings ($M = 6.46$; $SD = 1.14$; Mdn (IQR) = 7.00 (7.00 to 7.00)), 87.1% stated that they (almost) always refrained from shaking hands in the past two months ($M = 6.76$; $SD = 0.70$; Mdn (IQR) = 7.00 (7.00 to 7.00)). A total of 77.6% students did not have cold-related symptoms or a high temperature/fever in the past two months. Of the remaining 22.4% students who had symptoms or fever, 77.2% stated that they got tested for COVID-19, and 90.9% of students who got tested stated that they (almost) always stayed at home as a precaution until they had the test results. The mean score of students' intention to adhere to guidelines was $M = 6.33$ ($SD = 0.75$); Mdn (IQR) = 6.50 (6.00 to 6.83). Moreover, students' intentions to adhere to COVID-19-guidelines of the university was positively correlated with their adherence behaviors (r 's ranging from 0.36 to 0.68 for the different behaviors; all p 's < .001; note that getting tested and isolating behavior was not included here).

Selecting the Most Relevant Determinants and Underlying Beliefs

In this section, we will report the results for 'Adherence to COVID-19- guidelines of the university' in detail, to illustrate the systematic approach for selecting determinants and their underlying beliefs, based on the CIBER plots (Peters & Crutzen, 2018). For keeping distance and getting tested/isolating, we report the detailed analyses in the Supplementary Materials, and just report summaries of the selected determinants and beliefs in this text.

Attitude

Both attitude questions (bad-good – further referred to as attitude/ good; and unpleasant-pleasant – further referred to as attitude/ pleasant) were positively associated with intention to adhere to guidelines ($r = 0.50$ and $r = 0.31$ respectively; both p 's < .001). However, attitude/good had a very high mean score ($M = 6.60$; $SD = 0.85$; Mdn (IQR) = 7.00 (6.00 to 7.00)) as opposed to attitude/pleasant ($M = 4.20$; $SD = 1.67$; Mdn (IQR) = 4.00 (3.00 to 5.00)). Although both attitude items were positively correlated with intention, for attitude/good (see Figure 3.1, right panel), students were

already convinced that adhering to COVID-19-guidelines of the university would be good (see Figure 3.1, left panel). Therefore, there is less to no room for improvement for attitude/ good, while attitude/pleasant could be targeted with accepting the disadvantages in balance with the evident advantages.

Perceived Norm

Both perceived norm items (i.e., “Most people like me always adhere to the general UM COVID-19 prevention guidelines” further referred to as PN/ like me; and “Most people who are important to me think I should adhere to the general UM COVID-19 prevention guidelines” further referred to as PN/ important others) were positively correlated with intention ($r = 0.35$ and $r = 0.55$ respectively; both p 's < .001). When analyzing the mean scores of both items separately, perceived norm/important others and perceived norm/like me had mean scores of $M = 6.14$ ($SD = 1.05$); Mdn (IQR) = 6.00 (6.00 to 7.00) and $M = 5.27$ ($SD = 1.37$); Mdn (IQR) = 5.00 (5.00 to 6.00) respectively. This indicates that PN/like me had a high relevance and more room for improvement than PN/important others, although both items are relevant targets for an intervention (see Figure 3.1). Both could become more positive with an appropriate intervention.

3

Means and associations (r) with intention to adhere to the guidelines ($R^2 = [.37; .55]$)

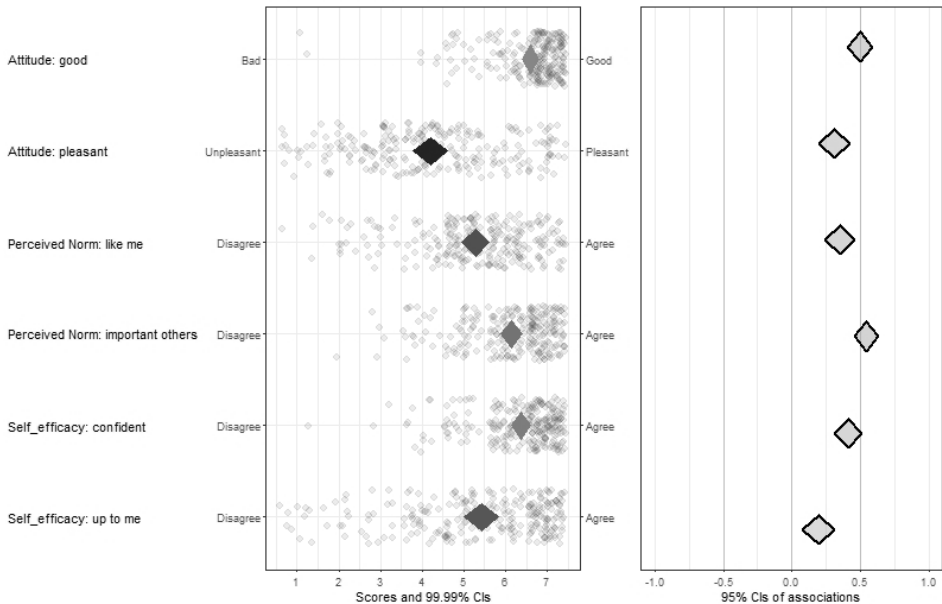


Figure 3.1: Univariate distributions of determinants and their association with intention to adhere to guidelines.

Note. On the left, the names of the determinants are displayed (or question items in Figure 3.2). The left-hand panel includes mean scores of determinants with 99.99% confidence intervals. The right-hand panel shows the association between the target variable (intention) and the determinants (e.g., attitude and perceived norm).

Self-Efficacy

Both self-efficacy items (“*I am confident that if I want to, I can adhere to the general UM COVID-19 prevention guidelines*” and “*Always adhering to the general UM COVID-19 prevention guidelines is up to me*”, further referred to as SE/confident and SE/up to me) were positively correlated with intention ($r = 0.42, p < .001$, and $r = 0.19; p < .01$ respectively). Both had relatively high mean scores (SE/confident: $M = 6.38, SD = 0.94, Mdn (IQR) = 7.00 (6.00 \text{ to } 7.00)$; SE/up to me: $M = 5.42, SD = 1.68, Mdn (IQR) = 6.00 (4.00 \text{ to } 7.00)$), which state that students were already confident that they can adhere to the guidelines, meaning there is less room for improvement. Even though students’ individual scores for SE/up to me were more scattered over the scale, the relevance was relatively low because it was only weakly correlated with intention (see Figure 3.1).

Risk Perception Beliefs

Out of four risk perception beliefs, ‘*I am not afraid of contracting COVID-19 because I am young*’ was negatively correlated with intention ($r = -0.33; p < .001$; see Figure 3.2, right panel) and the mean score was close to the middle of the scale ($M = 3.05; SD = 2.06; Mdn (IQR) = 3.00 (1.00 \text{ to } 5.00)$; see Figure 3.2, left panel). This suggests that this particular risk perception belief is highly relevant as a target for future interventions,

Means and associations (r) with intention to adhere to the guidelines ($R^2 = [.24; .44]$)

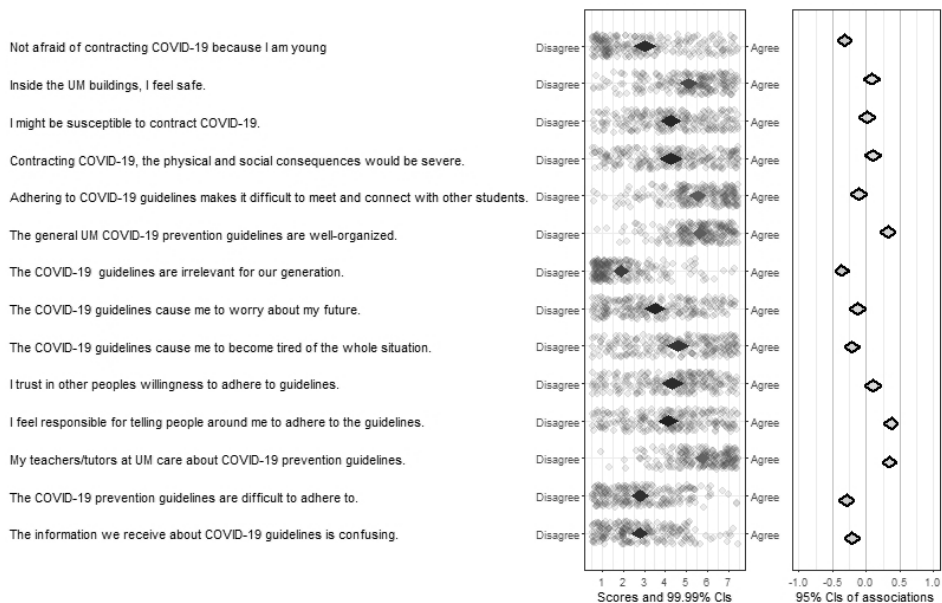


Figure 3.2: Univariate distributions of underlying beliefs and their association with intention to adhere to guidelines.

stressing that being young is not a guarantee for avoiding serious negative consequences of contracting COVID-19. All other risk perception beliefs were not significantly correlated with intention (all r 's ranged between -0.12 and 0.10 , with p 's $> .05$).

Attitudinal Beliefs

Attitudinal beliefs "*The general university COVID-19 prevention guidelines are irrelevant for our generation*" and "*The general university COVID-19 prevention guidelines cause me to become tired of the whole situation*" both had negative correlations with intention to adhere to guidelines ($r = -0.37$; $p < .001$ and $r = -0.22$; $p < .01$). In addition, "*The general university COVID-19 prevention guidelines are well-organized*" and "*I feel responsible for telling people around me to adhere to the guidelines*" was positively correlated with intention ($r = 0.32$ and $r = 0.37$ respectively, p 's $< .001$). Other attitudinal beliefs had no association with intention. As students showed strong disagreement with the item "*The general university COVID-19 prevention guidelines are irrelevant for our generation*", and because they already agreed that the guidelines are well-organized, these two items had relatively low potential for change. On the other hand, as the individual scores were all over the scale and the mean score was in the middle of the scale, the items of '*I feel responsible for telling people around me to adhere to the guidelines*' and '*The general university COVID-19 prevention guidelines cause me to become tired of the whole situation*' were highly relevant.

Perceived Norm Belief

The belief "*My teachers/tutors at the university care about the general UM COVID-19 prevention guidelines*" was positively correlated with students' intention to adhere to the guidelines ($r = 0.35$; $p < .001$). Since students are already convinced about this ($M = 5.74$; $SD = 1.27$; $Mdn (IQR) = 6.00 (5.00 \text{ to } 7.00)$), it had a relatively low relevance as a target for change.

Self-Efficacy Beliefs

Both self-efficacy beliefs ("*The general university COVID-19 prevention guidelines are difficult to adhere to*" and '*The information we receive about the general UM COVID-19 prevention guidelines is confusing*') had a negative correlation with intention (respectively: $r = -0.30$; $M = 2.80$; $SD = 1.52$; $Mdn (IQR) = 3.00 (2.00 \text{ to } 4.00)$; $r = -0.21$; $M = 2.78$; $SD = 1.55$; $Mdn (IQR) = 2.00 (2.00 \text{ to } 4.00)$; see Figure 3.2). Both beliefs could become more positive (meaning lower scores) through an intervention, especially the first, increasing students' self-efficacy to adhere to the guidelines.

Summary of Keeping 1.5 m Distance

Keeping distance was subdivided into three categories: keeping distance from people close to me, keeping distance from all other people, and avoiding crowds. In this section only the most relevant determinants and underlying beliefs are mentioned. Although relevance is subjective, we define most relevant as: 1) the correlation with intention is at least moderate ($r > 0.30$) AND 2) the mean score on a variable could potentially improve with *at least* 1 point (on the 7-point Likert-scale). Note that for each intervention a different focus can be decided, and with changing this definition, a ranking of most relevant determinants and underlying beliefs can be established. The above-mentioned rule to select the most relevant determinants/beliefs was also used for getting tested/isolating. All CIBER plots can be found in Supplementary materials file 3.

For the intention to keep distance to people close to the individual *and* to keep distance from all other people, both perceived norm (important others) and self-efficacy (confident) were seen as relevant and changeable. For keeping distance to all other people (contrary to people close to an individual), also one's risk perception ($r = 0.40$; $M = 5.69$; $SD = 1.33$; $Mdn (IQR) = 6.00 (5.00 \text{ to } 7.00)$), habit ($r = -0.31$; $M = 4.26$; $SD = 1.27$; $Mdn (IQR) = 4.33 (3.50 \text{ to } 5.17)$), and attitudinal belief "*Keeping 1.5m distance would ensure that other people do not contract COVID-19 through me*" ($r = 0.31$; $M = 5.76$; $SD = 1.29$; $Mdn (IQR) = 6.00 (5.00 \text{ to } 7.00)$) can be seen as important targets for intervention development. No additional determinants or underlying beliefs met our criteria of being relevant when it comes to "Avoiding crowds".

Summary of Results on Getting Tested/Isolating

Although many determinants related to getting tested and isolating when having COVID-19 related complaints had moderate to high correlations with intention ($N = 255$), only one attitudinal belief met our criteria for being highly relevant: "*Testing and isolating means taking care of yourself*" ($r = 0.46$; $M = 5.96$; $SD = 1.35$; $Mdn (IQR) = 6.00 (5.00 \text{ to } 7.00)$). However, in hindsight this statement might also have been interpreted as "only yourself", which makes it ambiguous.

Discussion

The aim of the study was to identify the most relevant determinants of students' adherence to general COVID-19-guidelines of the university. Students mostly adhere to guidelines, but there is room for improvement. In our study, we gave some insights

in how to select relevant and changeable determinants of adherence for future intervention development.

Similar to our earlier and the current study, Blake et al. (2021) found that students mostly adhere to guidelines. However, in some situations (e.g., due to the environment), they experience difficulties. Barrett and Cheung (2021) and Wismans et al. (2020) reported that college students perceived several barriers for successful adherence to preventive measures, in particular in relation to social distancing. In our earlier qualitative study (Chapter 2), we also found that students were willing to adhere to guidelines within the university buildings but besides mentioning several facilitators (e.g., the infrastructure of the buildings and reminders from staff) they perceived barriers for adherence to the behavioral guidelines, for example difficulties with telling friends to follow the regulations. Also, some students stated that they are not afraid of COVID-19 because they are young, which makes it difficult for them to see the need for following the guidelines.

Reicher and Drury (2021) claim that the main problem is not people's lack of willingness to adhere to guidelines. Our studies also point out that students mostly intend to adhere to COVID-19 guidelines, however, they might require the help of intervention developers to enhance the adherence. In order to change a behavior, we first need to know what to target (i.e., determinants (and underlying beliefs) of students' behaviors). Therefore, in the current study, we selected the determinants (and underlying beliefs) that have room for improvement, which makes them clear targets for an intervention, which we will describe in the next section (see Translating our findings into a small intervention).

This study had several limitations. First, due to the nature of our survey, findings are based on self-report. Therefore, the actual behavior and self-reported behavior might be different. However, in our earlier qualitative study, based on their observations, stewards/security people reported that students adhere to guidelines and are willing to do so. Therefore, high adherence rates found in the current study might not be due to social desirability but what we observe happening in practice within our university setting. Second, only students who are willing to visit the university in the next two months were invited and we do not know if the determinants of students who are willing to visit the university in the next two months and other students are the same. Third, although it was explicitly mentioned at the beginning of the questionnaire that we were not looking for desirable answers, social desirability might still be a factor that affected the results (however also see limitation 1). Fourth, we could not assess the determinants of all behaviors that were included in the guidelines of the university as a longer questionnaire might increase the drop-out rate/uncompleted responses. Fifth, the conditions constantly change, therefore, the guidelines and measures also. Currently

(April 2021), all universities have moved to mainly online-learning. The determinants might be different when vaccination rates have reached a critical threshold. Of course, that situation was not at hand during data collection for the current study, so the study might be repeated later to see how determinants change comparing a pre-vaccination vs. post-vaccination situation. However, our findings are still helpful for universities to create safe environments for their students when the universities are reopening. Moreover, one of the goals of this paper is to demonstrate how the findings of a determinant study can be translated into an intervention, so that others can use a similar approach. Sixth, our focus is not on theory or generalizable data; our focus is on the process of developing an intervention for the specific situation at our university at that time and that process is hopefully generalizable to other settings and times. Lastly, we mainly utilized the theories of Reasoned Action Approach and Protection Motivation Theory and the results of our qualitative study in the selection of determinants and formulation of questions related to these determinants. Hence, there might be other determinants that affect students' adherence behaviors that are not included in the study at hand. However, building on the results of the qualitative research among this target group, we are convinced that we covered the most salient beliefs.

Translating Our Findings Into a Small Intervention

Based on the findings of this study, the most relevant determinants and underlying beliefs behind students' adherence to the guidelines were selected. While the Christmas/New Year break was approaching, a small intervention, a *New Year's message to students*, was created which included the intervention messages targeting determinants of students' adherence to guidelines, and specific behaviors, in this case specifically keeping distance from others during the Christmas break, as most students go visiting their families and friends; see Figure 3.3. Embedded in the New Year's message was a short documentary (Marketing & Communications Maastricht University Office, 2020), in which students who have had COVID-19 share what this disease has done and is still doing to them. They also let us know what they think of the measures. This video was developed independently, but it provided an excellent 'real life' input to the message, and both complement each other.

The New Year's message was carefully crafted combining the outcomes of our determinants' study and the available literature on effective communication for behavior change. Based on the observed risk behaviors from the survey, and their determinants, the main focus was on (1) the limited group of students who indicated that they are "not afraid of contracting COVID-19 because I am young"; (2) students

Good preparation for a better 2021

For most of us, 2020 has not been easy. People became seriously ill from COVID-19. Some lost loved ones to the virus. And our social lives were largely put on hold^a. Many of you have taken responsibility, for yourselves and for others. You have consistently followed the government guidelines both on and off the UM campus^b. That makes us proud and grateful^c.

Unfortunately, the end of the pandemic is not yet in sight^a. That is why we are looking ahead to the upcoming holiday period and the beginning of 2021. Our message: please stay the course so that 2021 will be a better year for all of us^c.

Even if you are young!

It is a well-established fact that young people can transmit COVID-19 without experiencing any symptoms themselves^d. So, even if you are young and think you are protected against the effects of COVID-19, you can still be a danger to others^d. Imagine how you would feel if someone else who is vulnerable were to become infected with COVID-19 because of you^e. This could happen while you are visiting your family during the Christmas holidays, as well as if you stay in Maastricht and fail to follow the safety protocols^f. Therefore, however healthy and strong you may feel, make sure you keep your distance and follow the guidelines as long as the pandemic persists^g. This is how you can help to ensure that society returns to normal^h.

Sometimes young people do not feel sick if they have COVID-19. But often they doⁱ. In this short documentary, students who have had COVID-19 share what this disease has done and is still doing to them^{jk}. They also let us know what they think of the measures^{lm}.

**Good preparation...**

Nobody underestimates how difficult it is—keeping your distance, few social contacts, not celebrating the holidays with your entire family and all your friends^a. You can make it easier on yourself by thinking about it now. Prepare in advance, so you know what you are going to do to stay healthy and safe during the holiday period^a. That way, you know what lies ahead. For example, you could follow these tips:

- Discuss in advance with your family and friends how to get through the holidays safely. For instance, create a top-10 list of safe activities that you can do together and make agreements on how to protect each other^a.
- Head outdoors and take a walk in nature while staying 1.5 meters away from each other^a.
- Keeping a physical distance doesn't mean you can't have social contacts. Celebrate New Year's via Zoom or another platform^a. If we all do it, this will hopefully be the first and last time it needs to be done^a.

Figure 3.3: New Year's message for the students, plus identification of underlying behavior change methods.
Figure 3.3 continues on next page.

- Organize social gatherings in such a way that it is easy to keep your distance^a.
- If you have friends who don't want to follow the guidelines, don't invite them^p. Also, don't visit people who are breaking the rules^p. That might sound strict, but by doing this, you are helping a huge group of people^c. Remember, the more people and the closer together they are, the faster the virus spreads^{a,d}.
- Very important: don't go to a social gathering if you have symptoms of COVID-19^{a,d}. You can always call for a quick and easy test and stay at home until you have the results^p. Of course, don't visit anyone if you have any symptoms, even if they are mild^a.

...makes for a better 2021!

A vaccine will be available in 2021. It will take a while before everyone gets their turn, but then we can move on to a new normal^f. Until then, as a UM community, we will also follow the guidelines. It is a question of perseverance, however difficult it may be, but we are doing it for our friends, our families, the vulnerable in our society, and for ourselves^c. Together, we will overcome^{a,h,l}.

Happy holidays and come back healthy!

Figure 3.3: Continued.

a: Consciousness raising; b: Feedback; c: Reinforcement; d: Scenario-based risk information; e: Anticipated regret; f: Punishment; g: Goal setting; h: Environmental re-evaluation; i: Personalize risk; j: Modeling; k: Cultural similarity; l: Mobilizing social support; m: Information about others' approval; n: Planning coping responses; o: Environmental re-evaluation; p: Resistance to social pressure. All these methods and their parameters are described in: Bartholomew Eldredge et al., 2016: chapter 6, and: Kok et al., 2016: supplementary file (open access).

who feel responsible for telling other people “to adhere to the guidelines”; (3) students who “become tired of the whole situation”; and (4) students who indicate that the “prevention guidelines are difficult to adhere to”. These four determinants are targeted by appropriate behavior-change methods, derived from Intervention Mapping (Bartholomew Eldredge et al., 2016: chapter 6; Kok et al., 2016: Supplementary file). In these references, those methods, and their so-called parameters for effectiveness, are systematically described. See Figure 3.3 for the New Year's message, with the theoretical methods indicated in the text and described below the text. In the message, feedback and reinforcement are two examples of methods that were used. *Feedback* was used in the following intervention message: “Many of you have taken responsibility, for yourselves and for others. You have consistently followed the government guidelines both on and off the UM campus.” In terms of determinants, this message does not deny the difficulty in adhering to guidelines, but it does show that most students (as indicated in our survey) do adhere to this. This is also aimed to be *reinforced* in the next intervention message: “That makes us proud and grateful”. For those students that have difficulty adhering to guidelines, among others, the method of *planning coping responses* was used. This consisted of providing tips on how to deal with high-risk situations in the upcoming Christmas/New Year break. When looking at the parameters for effectiveness for planning coping responses, there are two aspects: (1) identification of high-risk situations and (2) practice of coping response. This shows that adequate

translation of the method into practical applications (in this case a New Year's message) is constrained by the vehicle used to deliver the intervention messages. In this general New Year's message, it was possible to identify high-risk situations and communicate those to students in combination with a number of practical tips on what to do. However, actual practicing of coping responses was left to the responsibility of students.

Conclusion

This study identifies the relevant determinants and underlying beliefs of students' adherence to COVID-19-guidelines. Moreover, it is a showcase demonstrating how results of a determinant study can be used when developing intervention messages. We do not know for sure if this intervention had the desired effect, but we are convinced that we have optimized the likelihood of achieving the desired effect by following the optimal theory- and evidence-based process in a short time period. That process can be repeated in comparable needs and times, even in different settings, where resources (time and budget) are constrained.

References

- Adhikari, S. P., Meng, S., Wu, Y. J., Mao, Y. P., Ye, R. X., Wang, Q. Z., & Zhou, H. (2020). Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: A scoping review. *Infectious Diseases of Poverty*, 9(1), 1–12. <https://doi.org/10.1186/s40249-020-00646-x>
- Ajzen, I. (2011). The theory of planned behavior: Reactions and reflections. *Psychology & Health*, 26(9), 1113–1127. <https://doi.org/10.1080/08870446.2011.613995>
- Auger, K. A., Shah, S. S., Richardson, T., Hartley, D., Hall, M., Warniment, A., & Thomson, J. E. (2020). Association between statewide school closure and COVID-19 incidence and mortality in the US. *JAMA*, 324(9), 859–870. <https://doi.org/10.1001/jama.2020.14348>
- Barrett, C., & Cheung, K. L. (2021). Knowledge, socio-cognitive perceptions and the practice of hand hygiene and social distancing during the COVID-19 pandemic: A cross-sectional study of UK university students. *BMC Public Health*, 21(1), 1–18. <https://doi.org/10.1186/s12889-021-10461-0>
- Bartholomew Eldredge, L. K., Markham, C. M., Ruiters, R. A. C., Fernández, M. E., Kok, G., & Parcel, G. S. (2016). *Planning health promotion programs: An intervention mapping approach*. John Wiley & Sons.
- Blake, H., Knight, H., Jia, R., Corner, J., Morling, J. R., Denning, C., & Vedhara, K. (2021). *Students' views towards SARS-CoV-2 mass asymptomatic testing, social distancing and self-isolation in a university setting during the COVID-19 pandemic: A qualitative study*. <https://doi.org/10.20944/preprints202101.0399.v1>
- Crutzen, R., & Peters, G. J. Y. (2017). Scale quality: Alpha is an inadequate estimate and factor-analytic evidence is needed first of all. *Health Psychology Review*, 11(3), 242–247. <https://doi.org/10.1080/17437199.2015.1124240>
- Crutzen, R., Peters, G. J. Y., & Noijien, J. (2017). Using confidence interval-based estimation of relevance to select social-cognitive determinants for behavior change interventions. *Frontiers in Public Health*, 5, 165. <https://doi.org/10.3389/fpubh.2017.00165>
- Fauci, A. S., Lane, H. C., & Redfield, R. R. (2020). *Covid-19—Navigating the uncharted*. <https://doi.org/10.1056/NEJMe2002387>
- Fernandez, M. E., Ruiters, R. A. C., Markham, C. M., & Kok, G. (2019). Theory-and evidence-based health promotion program planning: Intervention mapping. *Frontiers in Public Health*, 7, 209. <https://doi.org/10.3389/fpubh.2019.00209>
- Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. New York: Psychology Press.
- Head, J. R., Andrejko, K., Cheng, Q., Collender, P. A., Phillips, S., Boser, A., & Remais, J. V. (2020). The effect of school closures and reopening strategies on COVID-19 infection dynamics in the San Francisco Bay Area: A cross-sectional survey and modeling analysis. *medRxiv*. <https://doi.org/10.1101/2020.08.06.20169797>
- Kok, G. (2014). A practical guide to effective behavior change: How to apply theory- and evidence-based behavior change methods in an intervention. *European Health Psychologist*, 16(5), 156–170. <https://doi.org/10.31234/osf.io/r78wh>
- Kok, G., Gottlieb, N. H., Peters, G. J. Y., Mullen, P. D., Parcel, G. S., Ruiters, R. A. C., & Bartholomew, L. K. (2016). A taxonomy of behaviour change methods: An intervention mapping approach. *Health Psychology Review*, 10(3), 297–312.

- Maddux, J. E., & Rogers, R. W. (1983). Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. *Journal of Experimental Social Psychology, 19*(5), 469–479. [https://doi.org/10.1016/0022-1031\(83\)90023-9](https://doi.org/10.1016/0022-1031(83)90023-9)
- Marketing & Communications Maastricht University Office (Ron van der Bolt, film; Annabel Reke, producer). (2020). *Three UM students who have had COVID-19 share how it affected them [Streaming video]*. Available from https://maastrichtuniversity.bbvms.com/view/default_videoteam/4062759.html.
- Peters, G.-J. Y. (2014). A practical guide to effective behavior change: How to identify what to change in the first place. *European Health Psychologist, 16*(4), 142–155. <https://doi.org/10.31234/osf.io/hy7mj>
- Peters, G.-J. Y. (2021). *behaviorchange: Tools for behavior change researchers and professionals*. R package version 0.3. <https://r-packages.gitlab.io/behaviorchange>.
- Peters, G. J. Y., Abraham, C., & Crutzen, R. (2012). Full disclosure: Doing behavioural science necessitates sharing. *The European Health Psychologist, 14*(4), 77–84.
- Peters, G.-J. Y., & Crutzen, R. (2018). Establishing determinant importance using CIBER: An introduction and tutorial. *The European Health Psychologist, 20*(3), 484–494. <https://doi.org/10.31234/osf.io/5wjy4>
- Petretto, D. R., Masala, I., & Masala, C. (2020). School closure and children in the outbreak of COVID-19. *Clinical Practice and Epidemiology in Mental Health, 16*, 189. <https://doi.org/10.2174/2F1745017902016010189>
- Reicher, S., & Drury, J. (2021). Pandemic fatigue? How adherence to covid-19 regulations has been misrepresented and why it matters. *BMJ, 372*. <https://doi.org/10.1136/bmj.n137>
- Rothan, H. A., & Byrareddy, S. N. (2020). The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *Journal of Autoimmunity, 102*433. <https://doi.org/10.1016/j.jaut.2020.102433>
- Shereen, M. A., Khan, S., Kazmi, A., Bashir, N., & Siddique, R. (2020). COVID-19 infection: Origin, transmission, and characteristics of human coronaviruses. *Journal of Advanced Research*. <https://doi.org/10.1016/j.jare.2020.03.005>
- Van Bavel, J. J., Baicker, K., Boggio, P. S., Capraro, V., Cichocka, A., Cikara, M., & Drury, J. (2020). Using social and behavioural science to support COVID-19 pandemic response. *Nature Human Behaviour, 4*(5), 1–12. <https://doi.org/10.1038/s41562-020-0884-z>
- Von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., & Vandenbroucke, J. P. (2007). The strengthening the reporting of observational studies in epidemiology (STROBE) statement: Guidelines for reporting observational studies. *Annals of Internal Medicine, 147*(8), 573–577. <https://doi.org/10.7326/0003-4819-147-8-200710160-00010>
- Wismans, A., Letina, S., Thurik, R., Wennberg, K., Franken, I., Baptista, R., & Torr'es, O. (2020). Hygiene and social distancing as distinct public health related behaviours among university students during the COVID-19 pandemic. *Social Psychological Bulletin, 15*(4), 1–26. <https://doi.org/10.32872/spb.4383>
- Wood, W., & Rünger, D. (2016). Psychology of habit. *Annual Review of Psychology, 67*. <https://doi.org/10.1146/annurev-psych-122414-033417>
- World Health Organization. (2020). Behavioural considerations for acceptance and uptake of COVID-19 vaccines: WHO technical advisory group on behavioural insights and sciences for health, meeting report, 15 October 2020. (accessed January 2021) <https://apps.who.int/iris/bitstream/handle/10665/337335/9789240016927-eng.pdf>.
- Ziauddeen, N., Woods-Townsend, K., Saxena, S., Gilbert, R., & Alwan, N. A. (2020). Schools and COVID-19: Reopening Pandora's Box? *Public Health in Practice, 1*, Article 100039. <https://doi.org/10.1016/j.puhip.2020.100039>

Chapter 4

Facilitating Informed Decision Making: Determinants of University Students' COVID-19 Vaccine Uptake

This chapter is based on: Varol, T., Schneider, F., Mesters, I., Ruiter, R. A., C. Kok, G., & Ten Hoor, G. A. (2022). Facilitating Informed Decision Making: Determinants of University Students' COVID-19 Vaccine Uptake. *Vaccines*, 10(5), 704. <https://doi.org/10.3390/vaccines10050704>

Abstract

Background: Although several COVID-19 vaccines are available, the current challenge is achieving high vaccine uptake. We aimed to explore university students' intention to get vaccinated and select the most relevant determinants/beliefs to facilitate informed decision making around COVID-19 vaccine uptake.

Methods: A cross sectional online survey with students ($N = 434$) from Maastricht University was conducted in March 2021. The most relevant determinants/beliefs of students' COVID-19 vaccine intention (i.e., determinants linked to vaccination intention, and with enough potential for change) were visualized using CIBER plots.

Results: Students' intention to get the COVID-19 vaccine was high (80%). Concerns about safety and side effects of the vaccine and trust in government, quality control, and the pharmaceutical industry were identified as the most relevant determinants of vaccine intention. Other determinants were risk perception, attitude, perceived norm, and self-efficacy beliefs.

Conclusion: Our study identified several determinants of COVID-19 vaccine intention (e.g., safety, trust, risk perception, etc.) and helped to select the most relevant determinants/beliefs to target in an intervention to maximize COVID-19 vaccination uptake. Concerns and trust related to the COVID-19 vaccine are the most important targets for future interventions. Other determinants that were already positive (i.e., risk perception, attitudes, perceived norms, and self-efficacy) could be further confirmed.

Keywords: vaccine; COVID-19; intention; determinants; university students

Introduction

The world has been trying to combat the COVID-19 pandemic since late December 2019 (Rothan and Byrareddy, 2020). Governments implemented public health measures that were deemed to be the only way to prevent the spread of SARS-CoV-2 until the roll-out of the COVID-19 vaccines (Bedford et al., 2020; Kissler et al., 2020). However, new developments brought new challenges, such as vaccine donation (see, e.g., Guidry et al., 2021) and COVID-19 vaccine hesitancy, defined by the WHO Strategic Advisory Group of Experts (SAGE) on Immunization as *the delay in acceptance or refusal of vaccines despite availability of vaccine services* (Chevallier et al., 2021; MacDonald, 2015; WHO, 2014, p. 7).

Since several COVID-19 vaccines were developed or are currently under development, people's intention to get the COVID-19 vaccine as a vital step is the focus of health professionals and governments. High vaccine uptake is deemed important to control the spread of COVID-19 (Chevallier et al., 2021; DeRoo et al., 2020). Several studies demonstrated that people's intention to get vaccinated against COVID-19 is positive, yet not positive enough (Malik et al., 2020; Paul et al., 2021) and that there is room for improvement. To increase vaccine uptake, identifying the so-called determinants/ beliefs behind people's intention to engage in health behavior, such as vaccination against COVID-19, is the key to develop successful evidence and theory-based interventions (Kok, 2014; Peters, 2014). As behavior change methods do not directly operate on the behavior itself but on its determinants, intervention developers first need to map the determinants of behavior/intention and then select the most relevant ones for an intervention (Kok et al., 2016; Peters, 2014). In a systematic review by Larson et al. (2014), an attempt was made to understand vaccine hesitancy and its determinants, but answers remained inconclusive: they concluded that determinants of vaccine hesitancy are context-specific and varying across time, place, and type of vaccine. Therefore, in this study, we systematically determined and selected the most relevant determinants/beliefs of COVID-19 vaccine intention of university students.

Theories Behind the Study

An earlier meta-analysis has shown clear support for the utility of Theory of Planned Behavior in explaining vaccine hesitancy (Xiao & Wong, 2020). The Theory of Planned Behavior (or in updated version the Reasoned Action Approach (Fishbein & Ajzen, 2010); Theory of Planned Behavior (Ajzen, 2015)) postulates that behavior is influenced by one's intention to engage in that behavior, and intention is influenced by three determinants with underlying beliefs: (a) attitude, one's (positive/negative)

evaluation of the consequences of engaging in a behavior; (b) perceived norm, one's perception that important others might (dis)approve of them for engaging in a behavior (injunctive norm) and one's perception that others like themselves do (or do not) engage in a behavior (descriptive norm); (c) perceived behavioral control (or self-efficacy), one's perception about whether they are capable of, or have control over, executing a behavior. Protection Motivation Theory (Maddux and Rogers, 1983; Rutter et al., 2014), on risk perception, declares that (a) threat appraisal, people's perception of the severity of a threat (perceived severity) and people's perception of how susceptible they are to a threat (perceived susceptibility), and (b) coping appraisal, people's expectation of whether engaging in a behavior will lead to a change (response efficacy) and people's perception of whether they can perform a behavior successfully (self-efficacy), determine people's risk perception and how they will respond to a threat. In the case of vaccination intention, determinants related to automaticity and habit do not seem to be essential.

Current Study

The aims of this study were to (1) examine university students' intention to get the COVID-19 vaccine and (2) select the most relevant (i.e., correlated to one's intention, and showing room for improvement) determinants/beliefs of students' intention to get vaccinated to target in an intervention. By COVID-19 vaccine, we refer to vaccines that are approved for use in the EU at the time that this study was executed.

Methods

Participants and Recruitment

Maastricht University students were recruited (8 March until 29 March 2021) through a student panel operated by Flycatcher (2021) (an online survey platform <https://www.flycatcher.eu/en/Home/OverOons> [accessed on 21 March 2022]). The student panel is refreshed at the beginning of each academic year by including new students and is representative of all the study years. All panel members of the student panel were invited to the survey. Three reminders were sent to the students (on 15, 22, and 25 March). Students who completed the survey received a small incentive for their participation. This study was approved by the Ethics Review Committee Psychology & Neuroscience, Maastricht University (reference number 188_10_02_2018_S59).

Design and Procedure

The cross-sectional online survey could be accessed upon clicking the hyperlink sent with an e-mail invitation. After informed consent, students received questions on the topics of (1) their views on the risk of contracting COVID-19 and its severity (risk perception); (2) concerns and trust around the COVID-19 vaccine (concerns and trust—specific attitudinal and risk-perception beliefs); (3) their opinions about getting the COVID-19 vaccine (attitude); (4) what they think about what other people will do or want them to do regarding getting the COVID-19 vaccine (perceived norm); (5) potentially difficult situations regarding getting the COVID-19 vaccine (self-efficacy); and (6) their intentions to get the COVID-19 vaccination (intention). Students were also asked about their demographic information. All questions were in English to reach all the students (both Dutch and international) within the university (note that all students have a good command of English).

Measurements

The questionnaire was developed based on the available literature on COVID-19- vaccine hesitancy and vaccine hesitancy in general (Daly and Robinson, 2021; Dror et al., 2020; Neumann-Böhme et al., 2020; Quinn et al., 2019; Taylor et al., 2020) and further revised based on a qualitative pretest with students (data not published—in this pretest we asked for examples about information needs and trusted resources). The underlying theories behind the questionnaire were the Reasoned Action Approach (RAA) and the Protection Motivation Theory (PMT). Questions can be found at the OSF: <https://osf.io/fzep9/>.

Intention was assessed with the item “I intend to get the COVID-19 vaccination when invited to do so”, which was answered on a 7-point Likert scale (fully disagree (1)—fully agree (7)). Another two intention questions were asked based on two different scenarios regarding waiting to get the COVID-19 vaccine: (1) “When it is my turn, I think I will wait to see if others experience any negative side effects due to getting the COVID-19 vaccination” and (2) “When it is my turn, I think I want to wait until next year before I make a decision about getting the COVID-19 vaccination” with a 7-point Likert answer option and in case, they are not willing to get the COVID-19 vaccine, “I do not intend to take the vaccination” response option was included.

Risk perception was assessed with five items such as “I think that without vaccination, I might be at risk of contracting COVID-19”; “I think that if I contract COVID-19, the physical consequences for me would be severe”; and “I know people who have severe health problems due to COVID-19”. All items were answered on a 7-point Likert scale; fully disagree (1)—fully agree (7).

Concerns and trust is partly underlying attitude and risk perception, and focused on students' evaluations about the development, safety, possible short- and/or long-term side effects of the COVID-19 vaccine as well as students' trust in government, pharmaceutical industry, and quality control with regard to the COVID-19 vaccine. Additionally, three items were included to compare the COVID-19 vaccine with current vaccines in the National Immunization Program in relation to safety, effectiveness, and trustiness. There were 14 items in total; example items are "I am worried about the speed of the development of the vaccine"; "I am worried about the safety of the COVID-19 vaccine"; "I am worried about possible long-term (more than a week) negative side effects of the COVID-19 vaccine"; "I trust the government about ensuring the safety of the COVID-19 vaccine". Except for "How many people do you know who already received the COVID-19 vaccine and had no serious complaints afterwards?" item (answer option: none (1)—many (7) and I do not know people who already received the COVID-19 vaccine), all items were responded on a 7-point Likert scale (fully disagree (1)—fully agree (7)).

Attitude consisted of seven items, for instance, "I think that by getting the COVID-19 vaccine, I protect myself against contracting COVID-19"; "I think that getting the COVID-19 vaccine is a way out of this pandemic"; and "I think that getting the COVID-19 vaccine is my moral duty". All attitude items were answered on a 7-point Likert scale (fully disagree (1)—fully agree (7)).

Perceived norm included three items with a 7-point Likert scale answer option (fully disagree (1)—fully agree (7)): "I think that most people like me will get the COVID-19 vaccination"; "I think that my doctor/health care provider wants me to get the COVID-19 vaccination"; and "I think that most people who are important to me want me to get the COVID-19 vaccination".

Self-efficacy was measured with six items, e.g., "If I would decide to get the COVID-19 vaccination, I am confident that I could get it when it is my turn"; "I feel comfortable talking to my family and/or friends about whether or not to get the COVID-19 vaccination"; and "I am confident that before I decide to get the COVID-19 vaccine, I will have sufficient information about the COVID-19 vaccine". A 7-point Likert scale was used for the answer options (fully disagree (1)—fully agree (7)).

Demographics were measured by asking age, gender, study year, faculty, living condition and nationality (Dutch or international).

Data Analysis

Descriptive statistics were analyzed by using IBM SPSS Statistics 26, and the associations between intention and all determinants/beliefs were calculated and reported (for

an example, see Chapter 3). The Confidence Interval-Based Estimation of Relevance (CIBER, [Peters & Crutzen, 2018]) approach was used to establish the determinant/belief relevance depending on (1) the association between the intention to get the COVID-19 vaccine and determinants (e.g., risk perception) and (2) the room for improvement based on the univariate distribution of each determinant/belief. For instance, if a determinant/belief has no correlation with intention but has room for improvement, this determinant/belief would unlikely be a determinant to intervene on, whereas a determinant/belief correlated with intention and has a mean score on the middle of the scale or on the undesirable direction would be a relevant target. Therefore, combining these two types of information is necessary for establishing the determinant/belief relevance (Crutzen et al., 2017). While determining the relevance of a determinant/belief, it is important to check all the available information (and context) simultaneously, where the CIBER plots help inspect the information by visualizing the univariate distribution of each determinant/belief; the correlation between behavior/determinant and determinants; confidence intervals for the mean; and confidence intervals for bivariate correlations (Peters & Crutzen, 2018). The CIBER approach also allows intervention developers to study the determinants at a high level of specificity, i.e., sub-determinants or beliefs, that can be used in the intervention messages (Crutzen et al., 2017), as we did in our study. Contrary to commonly used multiple regression analysis in determinant studies which assesses the total explained variance in the dependent variable based on the determinants in the model, the CIBER approach assesses the determinant/belief relevance on the individual determinant level and postulates that the multiple regression analysis can be problematic to establish the determinant/belief relevance due to the overlap between the determinants (for details see; [Peters & Crutzen, 2018]). To create the CIBER plots, the 'behaviorchange' R package was used. The questionnaire and Supplementary Materials are available at the Open Science Framework: <https://osf.io/fzep9/>.

Results

Background Characteristics of the Sample

A total of 908 students were invited to the survey and 483 responded (53.2% response rate). From those, 43 incomplete responses and 2 responses with poor response quality (i.e., straight lining/patterns) were removed. Another four did not consent to participating, leading to a final sample of 434 students (47.8%). The mean age of eligible students was 22 (range: 18–42 years) (panel [based on data of UM Flycatcher student

panel members] = 22; range 18–43 years). A total of 75.3% of students were female (panel = 73.3%). Dutch (51.8%) and international students were equally represented; no difference in vaccination intention was found between Dutch and International students ($M = 6.16$ for Dutch students and $M = 6.23$ for international students, $p = 0.61$). For the different underlying determinants, some determinants scored significantly different, but the mean differences for the most were small (most determinants had a mean difference <0.30 , and all <0.70 —Data not reported but can be found in Supplementary Materials). Detailed background information about the sample is provided in Table 4.1.

Table 4.1: Background characteristics of the sample ($N = 434$)

Students	<i>N</i> (%)
Gender (female)	327 (75.3%)
Age in years ($M + SD$)	22.1 (3.5)
Study year	
Bachelor year 1	96 (22.1%)
Bachelor year 2	84 (19.4%)
Bachelor year 3	99 (22.8%)
Pre-master	1 (0.2%)
Master year 1	72 (16.6%)
Master year 2	51 (11.8%)
Master year 3	24 (5.5%)
Master year 4	7 (1.6%)
Living situation	
I live alone	88 (20.3%)
I live with my parent(s)/caretaker(s)	102 (23.5%)
I live with my partner	54 (12.4%)
I live with my partner and kid(s)	4 (0.9%)
I live with my kid(s)	1 (0.2%)
I live with people other than the abovementioned	185 (42.6%)
Faculty	
Faculty of Health, Medicine and Life Sciences (FHML)	178 (41%)
Faculty of Arts and Social Sciences (FASoS)	41 (9.4%)
Faculty of Psychology and Neuroscience (FPN)	50 (11.5%)
School of Business and Economics (SBE)	60 (13.8%)
Faculty of Law (FdR)	49 (11.3%)
Faculty of Science and Engineering (FSE)	56 (12.9%)
Nationality	
Dutch student	225 (51.8%)
International student	209 (48.2%)

Intention to Get the COVID-19 Vaccine

Of the 434 students, 348 (80.1%; score 6–7 [fully agree]) intended to get the COVID-19 vaccination when invited to do so (11 students fully disagreed to get vaccinated against COVID-19). The mean and median scores of students' intention were $M = 6.20$ (1–7); $SD = 1.44$; Mdn (IQR) = 7.00 (6–7); 11% of students agreed (6–7) with the item “When it is my turn, I think I will wait to see if others experience any negative side effects due to getting the COVID-19 vaccination”; 3.9% agreed (6–7) with “When it is my turn, I think I want to wait until next year before I make a decision about getting the COVID-19 vaccination”.

Selecting the Most Relevant Determinants/Beliefs

Almost all determinants that were selected for this study (based on theory and earlier research [Daly and Robinson, 2021; Dror et al., 2020; Neumann-Böhme et al., 2020; Quinn et al., 2019; Taylor et al., 2020]) 1) were correlated with the intention to get vaccinated, and 2) had potential room for improvement. With that, all items that correlated significantly with intention and have room for improvement (we defined ‘room for improvement’ as having a mean score less than 6), are potentially relevant as potential targets for future interventions. All mean, median, SD, IQR and r can be found in Supplementary Materials.

Concern and Trust

Although the most belief items were significantly correlated with vaccination intention, often the correlation coefficient was relatively low, or the mean score was relatively high (see Figure 4.1). The determinant with high correlations and the most room for improvement was “concern and trust” (except for one item where 12.4% indicated to not know anyone who already received the COVID-19 vaccine, mean scores were between 2.86 and 5.53, and r 's ranged from -0.27 to 0.67), and therefore an important intervention target. Items included (1) the safety and effectiveness of the vaccine, (2) possible side effects, and (3) trust in the government, the quality control and the pharmaceutical industry. Regarding three additional items comparing current vaccines in the National Immunization Program against diseases (such as measles, pertussis, diphtheria, and other diseases) with the COVID-19 vaccine showed that participants were neutral in terms of whether the COVID-19 vaccines are equally safe, effective, and trusted (i.e., mean scores close to the middle of the scale, showing that there is room for improvement; see Figure 4.1).

Means and associations (r) with intention to get COVID-19 vaccine ($R^2 = [.46; .6]$)

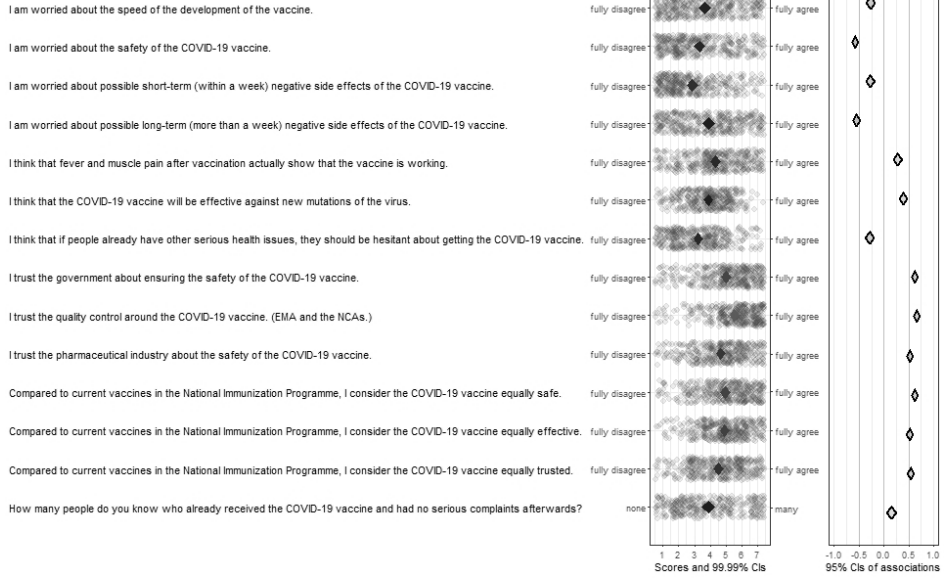


Figure 4.1: CIBER plot of concerns and trust visualizing means and association with intention to get the COVID-19 vaccine.

Means and associations (r) with intention to get COVID-19 vaccine ($R^2 = [.14; .27]$)

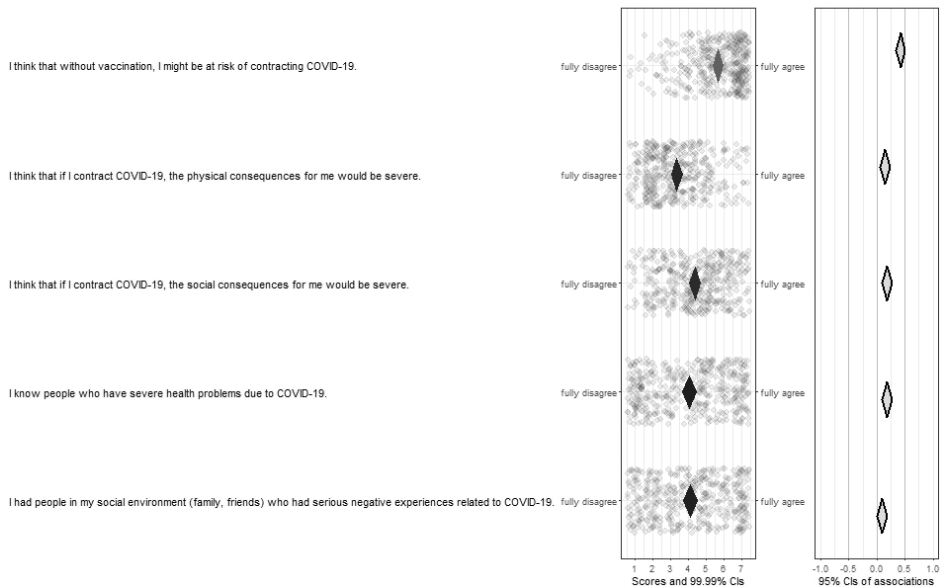


Figure 4.2: CIBER plot of risk perception visualizing means and association with intention to get the COVID-19 vaccine.

Means and associations (r) with intention to get COVID-19 vaccine (R² = [.59; .7])

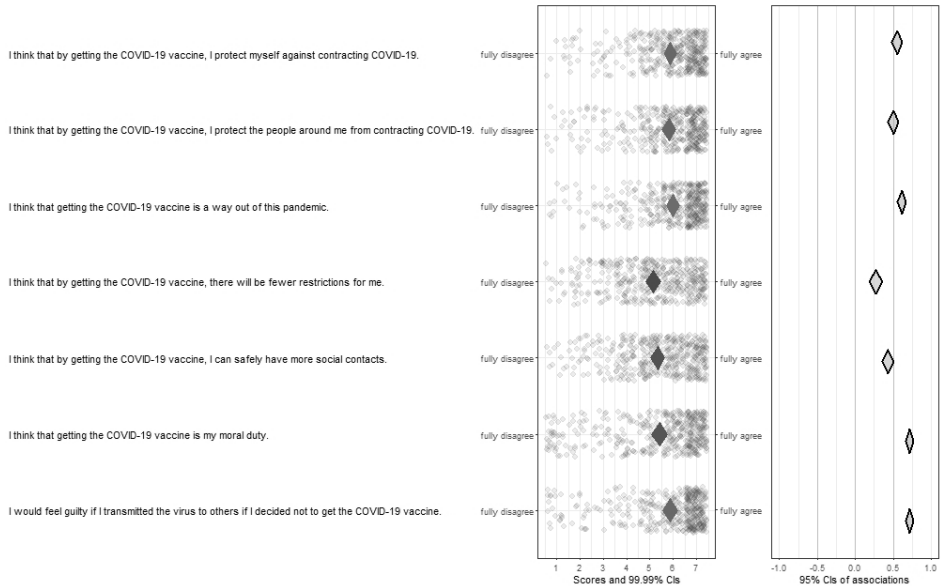


Figure 4.3: CIBER plot of attitude visualizing means and association with intention to get the COVID-19 vaccine.

Means and associations (r) with intention to get COVID-19 vaccine (R² = [.41; .55])

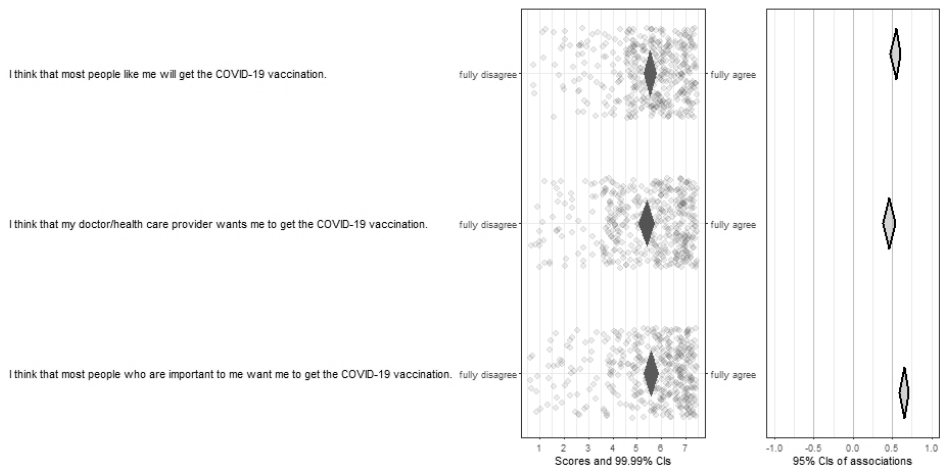


Figure 4.4: CIBER plot of perceived norm visualizing means and association with intention to get the COVID-19 vaccine.

Other Items That Should Be Considered as Target for Future Intervention

All risk perception items (see Figure 4.2), except “I had people in my social environment who had serious negative experiences related to COVID-19” were significantly correlated with vaccination intention (*r* ranges from 0.15–0.43). Additionally, all items scored

neutral or positive and had room for improvement, making them important targets for future interventions. Attitude (Figure 4.3), perceived norm (Figure 4.4), and self-efficacy (Figure 4.5) items had high correlations (r 's ranging from 0.27 to 0.72), but also had high mean scores (M 's ranging from 5.13–6.08), making those determinants important targets for confirmation in interventions, but not for improvement per se.

Means and associations (r) with intention to get COVID-19 vaccine ($R^2 = [.29; .43]$)

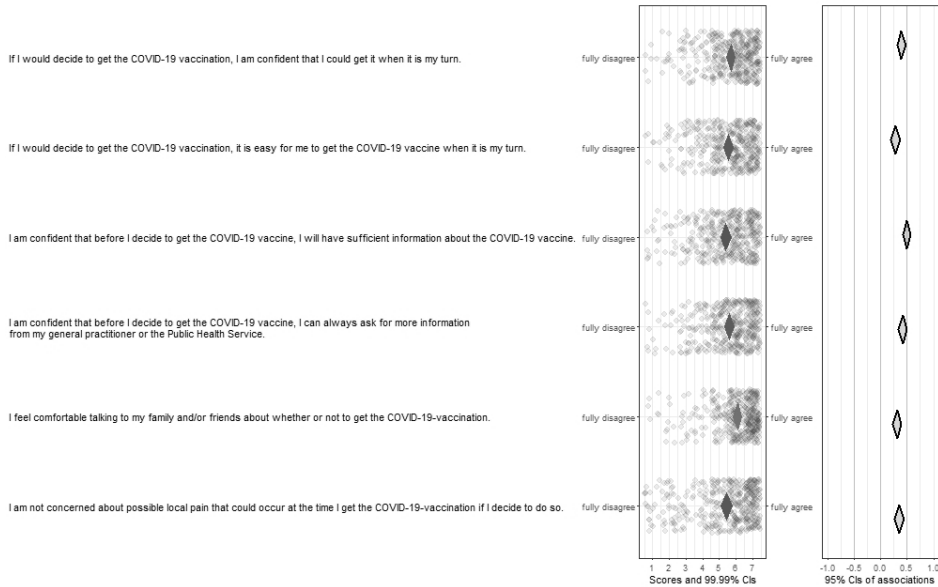


Figure 4.5: CIBER plot of self-efficacy visualizing means and association with intention to get the COVID-19 vaccine.

Discussion

While reopening universities, it is vital to prepare a safe educational environment for students and staff. This includes helping students to make informed decisions about the COVID-19 vaccination. In this study, we identified the reasons (determinants/beliefs) behind students' possible hesitancy for the COVID-19 vaccine and selected the most relevant determinants/beliefs to further improve the uptake.

Based on the findings of this study, most students (80%) intended to get the COVID-19 vaccine when it is their turn. Previous studies among university students also found relatively high willingness to be vaccinated against COVID-19 (Graupensperger et al., 2021; Barello et al., 2021; Pastorino et al., 2021). Nevertheless, people's intention to get the COVID-19 vaccine can be further enhanced by targeting its determinants.

Earlier studies on vaccine hesitancy illustrated attitude, perceived norm, and self-efficacy as determinants of people's vaccination intention (Larson et al., 2014; Xiao & Wong, 2020). What is shown in our study in the context of COVID-19 is that students have positive attitudes, perceived norms and self-efficacy in relation to the COVID-19 vaccines. This is in line with what other studies found (see, e.g., Guidry et al., 2021; Mo et al., 2021). Additionally, risk perception was found to be a determinant of students' vaccine intention, which was in line with the findings of previous studies (Caserotti et al., 2021; Dubé et al., 2013; Reiter et al., 2020; Soares et al., 2021; Wang et al., 2020). Therefore, those determinants should be further confirmed in future interventions.

Our study demonstrated that the concerns about the safety and side effects of the COVID-19 vaccine, and trust in the government about the safety of the vaccine, the quality control, and the pharmaceutical industry, are the most important intervention targets to improve students' intention to be vaccinated against COVID-19. Specifically, the possible long-term side effects and safety of the COVID-19 vaccines were the main concerns among students. This is in line with the findings from other studies in which the safety and trust were found as the most important determinants of intention to get the COVID-19 vaccine as well (Karlsson et al., 2021; Paul et al., 2021; Taylor et al., 2020). However, when students were asked whether the COVID-19 vaccines are equally safe, effective, and/or trusted compared to the current vaccines in the National Immunization Program, students mostly scored neutral, which might, or might not, be indicative of a general hesitancy about vaccines' safety, effectiveness, and trustiness worldwide (Dubé et al., 2013). Future (potentially more qualitative) studies could help answering this question.

An Intervention to Promote Informed Decision Making

Based on the findings of this study, the most relevant determinants/beliefs behind students' intention to get the COVID-19 vaccine are listed in Table 4.2. For each belief, a theoretical change method is selected that fits with the general determinant (Kok et al., 2016), for example "If I contract COVID-19, the physical consequences for me would be severe" had a mean that was relatively low, in combination with a relatively low correlation. Both should be higher (that is: ideally it is desired that people perceive COVID-19 as having severe consequences). One method for increasing risk perception (and the correlation with intention to vaccinate) is "consciousness raising" (either about the risk, or about the consequences). All methods for change have so-called parameters for effectiveness that need to be fulfilled (Kok et al., 2016), for example consciousness raising should always be combined with (an improvement

Table 4.2: An example of pairing the relevant determinants with behavior change principles to target in intervention

Determinant/Item	Change *	Method	Parameters
Risk perception:			
Without vaccination, I might be at risk of contracting COVID-19	5.7 ↑	[Belief selection/done]	- self-efficacy improvement
If I contract COVID-19, the physical consequences for me would be severe	3.3 ↑	- Consciousness raising	- gain frames
If I contract COVID-19, the social consequences for me would be severe	4.4 ↑	- Framing - Self-affirmation	- tailored to the individual
Concerns and trust:			
Concerns about the safety of the COVID-19 vaccine	3.3 ↓	- Scenario-based risk info	- plausible cause-effect
Concerns about possible long-term negative side effects of the COVID-19 vaccine	3.9 ↓	- Persuasive communication	- relevant, not-discrepant, arguments
The COVID-19 vaccine will be effective against new mutations of the virus	3.9 ↑	- Tailoring	- interactive (if possible?)
I trust the government about ensuring the safety of the COVID-19 vaccine	5.0 ↑		
I trust the quality control around the COVID-19 vaccine	5.5 ↑		
I trust the pharmaceutical industry about the safety of the COVID-19 vaccine	4.7 ↑		
[Compared to current vaccines in the National Immunization Program:]			
I consider the COVID-19 vaccine equally safe	5.0 ↑		
I consider the COVID-19 vaccine equally effective	4.9 ↑		
I consider the COVID-19 vaccine equally trusted	4.5 ↑		
Attitude/Outcome expectations:			
By getting the COVID-19 vaccine, I can safely have more social contacts	5.3 ↑	- Shifting focus	- new reason (postponed reward)
I think that getting the COVID-19 vaccine is my moral duty	5.4 ↑	- Self-reevaluation	- self-image/high self-efficacy
I would feel guilty if I transmitted the virus if I decided not to get the vaccine	5.9 ↑	- Anticipated regret	- imagery/positive about avoiding negative consequences

Table 4.2: *Continued*

Determinant/Item	Change *	Method	Parameters
Perceived norm/Social influence:			
People like me will get the COVID-19 vaccination	5.5 ↑	- Info about others' approval	- are present
My doctor/health care provider wants me to get the COVID-19 vaccination	5.4 ↑	- Resistance to social pressure	- commitment/values
People who are important to me want me to get the COVID-19 vaccination	5.6 ↑	- Mobilizing social support	- available; trust
		- Modeling	- reinforcement, identification, self-efficacy, coping
Self-efficacy/Perceived control:			
I am confident that I could get it when it is my turn	5.7 ↑	- Modeling	- reinforcement, identification, self-efficacy, coping
It is easy for me to get the COVID-19 vaccine when it is my turn	5.5 ↑	- Guided practice	- demonstration, instruction, enactment
I will have sufficient information about the COVID-19 vaccine	5.4 ↑	- Planning coping responses	- identification and practice
I can always ask for more information from my general practitioner/PHS	5.6 ↑	- Goal setting	- commitment to the goal
I am not concerned about possible local pain that could occur	5.4 ↑		
From the university:			
		- Advocacy/active support	- matching style, consciousness raising/persuasion / approval
		- Technical assistance	- fit culture and resources
		- Mass-media role modeling	- appropriate models being reinforced

* Numbers indicate the mean scores, and the direction of the arrow refers to the direction of the intended change.

in) self-efficacy. In a qualitative part of this project, we asked which aspects students wanted to get information about, and by whom. Students indicated that they preferred science-based information from content experts, supported by high-level scientific publications. Based on this study, an intervention was developed that consisted of a series of videos on a special website of the university on COVID-19 directed at students. The actual form was an interview by one student with, each time, an expert. The first part was about risk perception and worries and trust, with two experts in clinical microbiology, the second part on attitudes and perceived norms with two experts in health promotion/health psychology, and the third part about perceived control was covered with clear online instructions on how, where and when to get the vaccine, especially focused on international students. More information on the intervention development and lessons learned can be found in Chapter 5.

Limitations

The limitations of this study include: first, rapid changes happen in terms of vaccine availability (e.g., the developments with AstraZeneca vaccine) as well as the COVID-19 regulations (e.g., relaxations in the measures) and depending on these developments and the related media coverage, the intention of students to get vaccinated against COVID-19 might also change over time. Therefore, follow-up studies at different time points might be needed to have a better view of students' intention level and its determinants. Second, we could only assess a limited number of determinants/beliefs since longer surveys might lead to a decline in the response rate. Therefore, there might be other important determinants/ beliefs that might (positively or negatively) contribute to students' vaccine intention. Additionally, the CIBER approach is helpful in eliminating irrelevant/not changeable determinants, but selection has to be carried out carefully at all times; sometimes, for example, it is needed to create interventions to keep a specific determinant at a certain high level. Systematic or scoping reviews compiling the theories used in the studies of COVID-19 vaccination or vaccination in general might be helpful for the identification of the determinants of vaccine intention and provide a roadmap for future vaccine studies. Third, this study was conducted in the Netherlands. As countries enforced varied regulations during the COVID-19 pandemic, selected relevant determinants may differ in other countries (see also [Larson et al., 2014]). Fourth, we used an already existing student panel for the data collection. Although the student panel is representative of the university students and the response was relatively high for this study, there might be some deviations in the responses.

Conclusion

In conclusion, the majority of students intended to get the COVID-19 vaccination. However, there is still some hesitation in relation to the safety and side effects of the COVID-19 vaccine as well as the trust in the government, quality control, and pharmaceutical industry, which can be addressed with scientific information from trusted sources that will assist in informed decision making. All relevant determinants/beliefs can be targeted in interventions to facilitate the COVID-19 vaccine uptake.

References

- Ajzen, I. (2015). The theory of planned behaviour is alive and well, and not ready to retire: a commentary on Sniehotta, Presseau, and Araújo-Soares. *Health Psychology Review*, 9(2), 131–137. <https://doi.org/10.1080/17437199.2014.883474>
- Barello, S., Nania, T., Dellafiore, F., Graffigna, G., & Caruso, R. (2020). ‘Vaccine hesitancy’ among university students in Italy during the COVID-19 pandemic. *European Journal of Epidemiology*, 35(8), 781–783. <https://doi.org/10.1007/s10654-020-00670-z>
- Bedford, J., Enria, D., Giesecke, J., Heymann, D. L., Ihekweazu, C., Kobinger, G., ... Wieler, L. H. (2020). COVID-19: towards controlling of a pandemic. *The Lancet*, 395(10229), 1015–1018. [https://doi.org/10.1016/S0140-6736\(20\)30673-5](https://doi.org/10.1016/S0140-6736(20)30673-5)
- Caserotti, M., Girardi, P., Rubaltelli, E., Tasso, A., Lotto, L., & Gavaruzzi, T. (2021). Associations of COVID-19 risk perception with vaccine hesitancy over time for Italian residents. *Social Science & Medicine*, 113688.
- Chevallier, C., Hacquin, A. S., & Mercier, H. (2021). COVID-19 vaccine hesitancy: Shortening the last mile. *Trends in Cognitive Sciences*. <https://doi.org/10.1016/j.tics.2021.02.002>
- Crutzen, R., Peters, G. J. Y., & Noijen, J. (2017). Using confidence interval-based estimation of relevance to select social-cognitive determinants for behavior change interventions. *Frontiers in Public Health*, 5, 165. <https://doi.org/10.3389/fpubh.2017.00165>
- Daly, M., & Robinson, E. (2021). Willingness to Vaccinate Against COVID-19 in the US: Representative Longitudinal Evidence From April to October 2020. *American Journal of Preventive Medicine*. <https://doi.org/10.1016/j.amepre.2021.01.008>
- DeRoo, S. S., Pudalov, N. J., & Fu, L. Y. (2020). Planning for a COVID-19 vaccination program. *Jama*, 323(24), 2458–2459. <https://doi.org/10.1001/jama.2020.8711>
- Dror, A. A., Eisenbach, N., Taiber, S., Morozov, N. G., Mizrachi, M., Zigron, A., ... Sela, E. (2020). Vaccine hesitancy: the next challenge in the fight against COVID-19. *European Journal of Epidemiology*, 35(8), 775–779. <https://doi.org/10.1007/s10654-020-00671-y>
- Dubé, E., Labege, C., Guay, M., Bramadat, P., Roy, R., & Bettinger, J. A. (2013). Vaccine hesitancy: an overview. *Human Vaccines & Immunotherapeutics*, 9(8), 1763–1773. <https://doi.org/10.4161/hv.24657>
- Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. New York: Taylor & Francis Group.
- Graupensperger, S., Abdallah, D. A., & Lee, C. M. (2021). Social norms and vaccine uptake: College students’ COVID vaccination intentions, attitudes, and estimated peer norms and comparisons with influenza vaccine. *Vaccine*, 39(15), 2060–2067. <https://doi.org/10.1016/j.vaccine.2021.03.018>
- Guidry, J. P., Laestadius, L. I., Vraga, E. K., Miller, C. A., Perrin, P. B., Burton, C. W., ... Carlyle, K. E. (2021). Willingness to get the COVID-19 vaccine with and without emergency use authorization. *American Journal of Infection Control*, 49(2), 137–142. <https://doi.org/10.1016/j.ajic.2020.11.018>
- Karlsson, L. C., Soveri, A., Lewandowsky, S., Karlsson, L., Karlsson, H., Nolvi, S., ... Antfolk, J. (2021). Fearing the disease or the vaccine: The case of COVID-19. *Personality and Individual Differences*, 172, 110590. <https://doi.org/10.1016/j.paid.2020.110590>
- Kissler, S. M., Tedijanto, C., Goldstein, E., Grad, Y. H., & Lipsitch, M. (2020). Projecting the transmission dynamics of SARS-CoV-2 through the postpandemic period. *Science*, 368(6493), 860–868. <https://doi.org/10.1126/science.abb5793>

- Kok, G. (2014). A practical guide to effective behavior change: How to apply theory- and evidence-based behavior change methods in an intervention. *European Health Psychologist, 16*(5), 156–170. <https://doi.org/10.31234/osf.io/r78wh>
- Kok, G., Gottlieb, N. H., Peters, G. J. Y., Mullen, P. D., Parcel, G. S., Ruiter, R. A., ... Bartholomew, L. K. (2016). A taxonomy of behaviour change methods: an intervention mapping approach. *Health Psychology Review, 10*(3), 297–312. <https://doi.org/10.1080/17437199.2015.1077155>
- Larson, H. J., Jarrett, C., Eckersberger, E., Smith, D. M., & Paterson, P. (2014). Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: a systematic review of published literature, 2007–2012. *Vaccine, 32*(19), 2150–2159. <https://doi.org/10.1016/j.vaccine.2014.01.081>
- MacDonald, N. E. (2015). Vaccine hesitancy: Definition, scope and determinants. *Vaccine, 33*(34), 4161–4164. <https://doi.org/10.1016/j.vaccine.2015.04.036>
- Maddux, J. E., & Rogers, R. W. (1983). Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. *Journal of Experimental Social Psychology, 19*(5), 469–479. [https://doi.org/10.1016/0022-1031\(83\)90023-9](https://doi.org/10.1016/0022-1031(83)90023-9)
- Malik, A. A., McFadden, S. M., Elharake, J., & Omer, S. B. (2020). Determinants of COVID-19 vaccine acceptance in the US. *EClinicalMedicine, 26*, 100495. <https://doi.org/10.1016/j.eclinm.2020.100495>
- Mo, P. K. H., Luo, S., Wang, S., Zhao, J., Zhang, G., Li, L., ... Lau, J. T. (2021). Intention to Receive the COVID-19 Vaccination in China: Application of the Diffusion of Innovations Theory and the Moderating Role of Openness to Experience. *Vaccines, 9*(2), 129. <https://doi.org/10.3390/vaccines9020129>
- Neumann-Böhme, S., Varghese, N. E., Sabat, I., Barros, P. P., Brouwer, W., van Exel, J., ... Stargardt, T. (2020). Once we have it, will we use it? A European survey on willingness to be vaccinated against COVID-19. *European Journal of Health Economics, 21*, 977–982. <https://doi.org/10.1007/s10198-020-01208-6>
- Pastorino, R., Villani, L., Mariani, M., Ricciardi, W., Graffigna, G., & Boccia, S. (2021). Impact of COVID-19 pandemic on flu and COVID-19 vaccination intentions among university students. *Vaccines, 9*(2), 70. <https://doi.org/10.3390/vaccines9020070>
- Paul, E., Steptoe, A., & Fancourt, D. (2021). Attitudes towards vaccines and intention to vaccinate against COVID-19: Implications for public health communications. *The Lancet Regional Health-Europe, 1*, 100012. <https://doi.org/10.1016/j.lanep.2020.100012>
- Peters, G.-J. Y. (2014). A practical guide to effective behavior change: how to identify what to change in the first place. *European Health Psychologist, 16*(4), 142–155. <https://doi.org/10.31234/osf.io/hy7mj>
- Peters, G.-J. Y. & Crutzen, R. (2018). Establishing determinant importance using CIBER: an introduction and tutorial. *The European Health Psychologist, 20*(3), 484–494. <https://doi.org/10.31234/osf.io/5wjy4>
- Quinn, S. C., Jamison, A. M., An, J., Hancock, G. R., & Freimuth, V. S. (2019). Measuring vaccine hesitancy, confidence, trust and flu vaccine uptake: Results of a national survey of White and African American adults. *Vaccine, 37*(9), 1168–1173. <https://doi.org/10.1016/j.vaccine.2019.01.033>
- Reiter, P. L., Pennell, M. L., & Katz, M. L. (2020). Acceptability of a COVID-19 vaccine among adults in the United States: How many people would get vaccinated?. *Vaccine, 38*(42), 6500–6507. <https://doi.org/10.1016/j.vaccine.2020.08.043>

- Rothan, H. A., & Byrareddy, S. N. (2020). The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *Journal of Autoimmunity*, *109*, 102433. <https://doi.org/10.1016/j.jaut.2020.102433>
- Ruiter, R. A., Kessels, L. T., Peters, G. J. Y., & Kok, G. (2014). Sixty years of fear appeal research: Current state of the evidence. *International Journal of Psychology*, *49*(2), 63–70. <https://doi.org/10.1002/ijop.12042>
- Soares, P., Rocha, J. V., Moniz, M., Gama, A., Laires, P. A., Pedro, A. R., ... Nunes, C. (2021). Factors associated with COVID-19 vaccine hesitancy. *Vaccines*, *9*(3), 300. <https://doi.org/10.3390/vaccines9030300>
- Taylor, S., Landry, C. A., Paluszek, M. M., Groenewoud, R., Rachor, G. S., & Asmundson, G. J. (2020). A proactive approach for managing COVID-19: The importance of understanding the motivational roots of vaccination hesitancy for SARS-CoV2. *Frontiers in Psychology*, *11*, 2890. <https://doi.org/10.3389/fpsyg.2020.575950>
- Wang, J., Jing, R., Lai, X., Zhang, H., Lyu, Y., Knoll, M. D., & Fang, H. (2020). Acceptance of COVID-19 Vaccination during the COVID-19 Pandemic in China. *Vaccines*, *8*(3), 482. <https://doi.org/10.3390/vaccines8030482>
- World Health Organization. (2014). *Report of the SAGE working group on Vaccine Hesitancy. 2014*. In Available on: http://www.who.int/immunization/sage/meetings/2014/october/SAGE_working_group_revised_report_vaccine_hesitancy.pdf (Accessed May 2021)
- Xiao, X., & Wong, R. M. (2020). Vaccine hesitancy and perceived behavioral control: A meta-analysis. *Vaccine*, *38*(33), 5131–5138. <https://doi.org/10.1016/j.vaccine.2020.04.076>

Chapter 5

Just-in-Time, but Still Planned: Lessons Learned from Speeding up the Development and Implementation of an Intervention to Promote COVID-19 Vaccination in University Students

This chapter is based on: Ten Hoor, G. A., Varol, T., Mesters, I., Schneider, F., Kok, G., & Ruiter, R. A. C. Just-in-Time, but Still Planned: Lessons Learned From Speeding up the Development and Implementation of an Intervention to Promote COVID-19 Vaccination in University Students. *Health Promotion Practice*, 15248399221095077. <https://doi.org/10.1177/15248399221095077>

Abstract

The process of developing a behavior change intervention can cover a long time period. However, in times of need, this development process has to be more efficient and without losing the scientific rigor. In this chapter, we describe the just-in-time, planned development of an online intervention in the field of higher education, promoting COVID-19 vaccination among university students, just before they were eligible for being vaccinated. We demonstrate how intervention development can happen fast but with sufficient empirical and theoretical support. In the developmental process, Intervention Mapping (IM) helped with decision-making in every step. We learned that the whole process is primarily depending on the trust of those in charge in the quality of the program developers. Moreover, it is about applying theory, not about theory-testing. As there was no COVID-19-related evidence available, evidence from related fields helped as did theoretical knowledge about change processes, next to having easy access to the target population and important stakeholders for informed qualitative and quantitative research. This project was executed under unavoidable time pressure. IM helped us with systematically developing an intervention, just-in-time to positively affect vaccine acceptance among university students.

Keywords: COVID-19 vaccination; Intervention Mapping; time lags; intervention development; health promotion

Introduction

COVID-19 caused many problems and forced health promoters to develop interventions under unavoidable time pressure. This haste is challenging as on average it takes 17 years “to move medical research from bench to bedside” (Morris et al., 2011, p. 510). However, the scientific process can become more efficient in times of need, and without losing credibility (Hanney et al., 2015). Especially, the COVID-19 pandemic taught us that there are ways to speed up intervention development and implementation, without losing scientific rigor (Hanney et al., 2020).

In this chapter, we describe the planned development of an online intervention to promote COVID-19 vaccination among students at Maastricht University (The Netherlands) within a time frame that was necessarily much shorter than usual (see Figure 5.1) because the age group of the students was eligible for vaccination within 6 months. Hanney et al. (2020) formulated four overlapping strategies to shorten the time lags from problem identification to intervention (or program) implementation in practice: (1) increasing resources (e.g., funding), (2) working in parallel (e.g., starting a next step if there is enough information), (3) starting or working at risk (e.g., expert consensus instead of new research), and (4) improving processes (e.g., accelerating procedures).

In the current project (and in line with Hanney’s suggestions), the importance of a high vaccination coverage was recognized by the University’s leadership as a condition for a safe reopening of the facilities, and for on-site teaching. Therefore—reducing further delays in the intervention development—resources were made available to facilitate our iterative intervention development (in line with the suggestions of Kwasnicka et al. (2021)). To further optimize efficiency and reducing time lags, several decisions were either based on psychological theories (e.g., reasoned action approach, when empirical evidence was not available) or taken in parallel/simultaneously by different stakeholders (e.g., research team, video/website developers, university board). With that, automatically more risks were taken in terms of (mis)communication, (faulty) decisions during the process, subsequent (in)effectiveness of the intervention, and with that (lowered) cost-effectiveness. To improve the intervention development process, and to limit the financial and safety risks, we applied the six steps of the Intervention Mapping (IM) protocol (Bartholomew Eldredge et al., 2016; Fernandez et al., 2019a; Kok et al., 2016). IM is a protocol that guides the design of multilevel health promotion interventions and implementation strategies (Bartholomew Eldredge et al., 2016). IM consists of six steps: (1) conduct a needs assessment or problem analysis by identifying what, if anything, needs to be changed and for whom; (2) create matrices of change

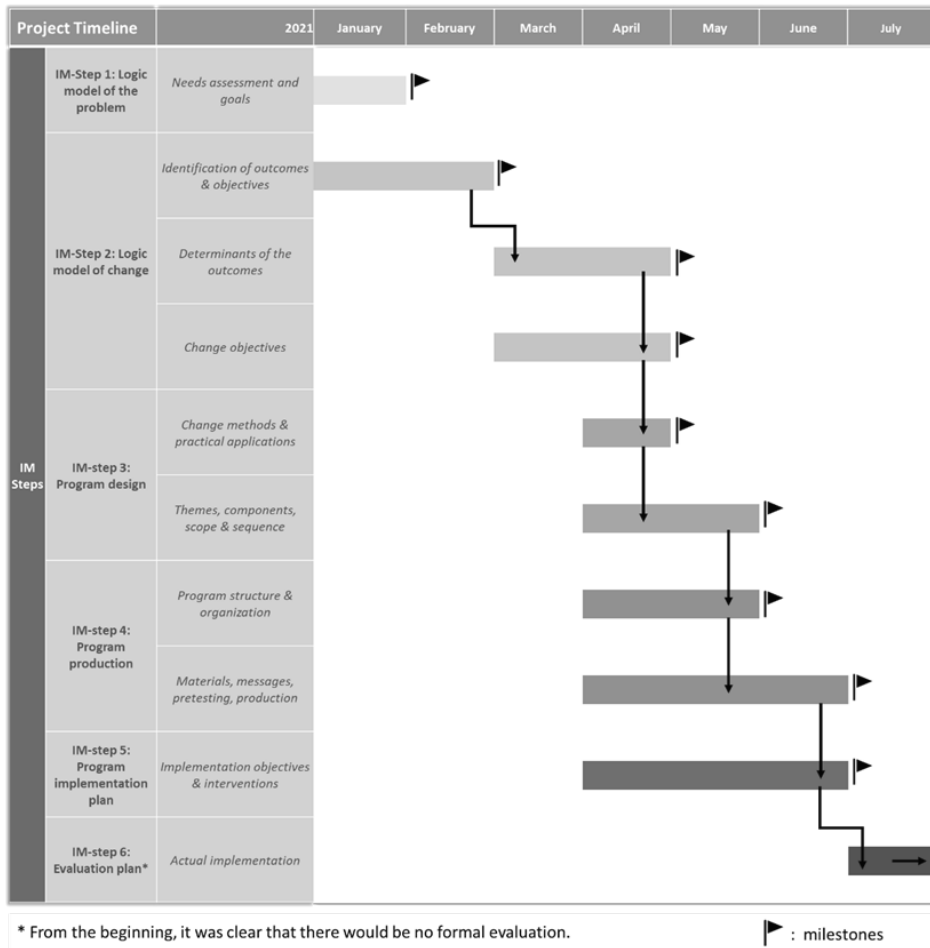


Figure 5.1: Time frame.

Note. IM = Intervention Mapping.

objectives by crossing performance objectives (sub-behaviors) with determinants; (3) select theory-based intervention methods that match the determinants, and translate these into strategies, or applications, that satisfy the parameters for effectiveness of the selected methods; (4) integrate the strategies into an organized program; (5) plan for adoption, implementation, and sustainability of the program in real-life contexts by identifying program users and supporters and determining what their needs are and how these should be fulfilled; (6) generate an evaluation plan to conduct effect and process evaluations to measure program effectiveness. Essentially, Steps 1 to 4 focus on the development of multilevel interventions to improve health behaviors and environmental conditions, Step 5 focuses on the development of implementation strategies to enhance program use, and Step 6 is used to plan the evaluation of both

the program itself and its implementation. Within each step of IM, the so-called “Core Processes” (Ruiter & Crutzen, 2020) were used to identify the important literature, apply the appropriate theories, and collect essential additional research data. In the following section, we will describe the IM steps that we took in more detail. In the Discussion section, we will reflect on the process in more detail in relation to the four strategies of Hanney et al. (2020).

IM-STEP 1: Logic Model of the Problem

COVID-19 is a new infectious disease (Ciotti et al., 2020). Its severity is highly variable, ranging from unnoticeable to life-threatening. Severe illness is more likely in elderly COVID-19 patients, as well as those who have underlying medical conditions. COVID-19 may transmit when people breathe in air contaminated by droplets and small airborne particles. People may spread the virus even if they do not develop any symptoms. Preventive measures reducing the chances of infection include, also for students: getting vaccinated, staying at home, wearing a mask in public, avoiding crowded places, keeping distance from others, ventilating indoor spaces, managing potential exposure durations, washing hands with soap and water often and for at least 20 seconds. Moreover, COVID-19 vaccines have demonstrated efficacy as high as 95% in preventing COVID-19 infections. At that time, in the Netherlands, those not vaccinated made up the large majority of COVID-19 patients (80%–90%), and vaccination coverage was around 85% in the adult population (Rijksinstituut voor Volksgezondheid en Milieu, 2021). Several vaccines have been developed and widely distributed since December 2020 (World Health Organization, 2020). Therefore, the goal of our program was to promote vaccination acceptance among university students, within a setting of informed decision-making which characterizes the approach of the Dutch government in motivating people to participate in national vaccination programs: “Given the availability of confusing and conflicting vaccine narratives, it is crucial that authoritative communication materials aim to build trust and support informed choices about vaccination” (Vivion et al., 2020, p. 112).

- Just-in-time: This step could be taken quite fast, as almost all information was already easily available.

IM-STEP 2: The Logic Model of Change

Identification of Behavioral and Environmental Outcomes and Performance

Objectives

In the first half of 2021, everyone aged 18 years and over in the Netherlands was, or would be, invited to be vaccinated against COVID-19, which is considered a voluntary decision (Government of the Netherlands, 2022). Visiting international students could be vaccinated as well, and the University has an agreement with the Local Public Health Office to provide those vaccinations. The behavioral outcome for all students in this case is responding positively to the invitation for the vaccination or, when a visiting international student, following up on the offer to contact the Local Public Health Office. For the University, the environmental outcome is limited to informing incoming international students among the whole student population about the existing facilities for vaccination. The behavioral outcome is relatively easy achievable as long as people have a positive intention, as there are few barriers (daCosta DiBonaventura & Chapman, 2005; Fall et al., 2018). For students, the performance objectives— what do the participants in the program need to do to perform the behavioral outcome?— include: scheduling the vaccination appointment, remembering to go, preparing all necessary paperwork, and following instructions on time, place, and optimal preparation (e.g., clothing, forms, and identification). The environmental outcomes and performance objectives for the Local Public Health Service are already in place.

Determinants of the Behavioral Outcomes

At that time, there were no systematic reviews of determinants for COVID-19 vaccination in university students. Our earlier studies in the same setting described the qualitative and quantitative studies among students about (social) preventive behaviors (e.g., distancing, testing), including a short intervention to promote preventive behaviors when students go home for the Christmas/New Year holiday (Chapters 2 & 3). A third study, a cross-sectional online survey with the University students' panel ($N = 434$) on vaccination behavior, was conducted in March 2021 (Chapter 4). Given the need for fast development, we formulated our questions based on existing validated theoretical constructs (e.g., Fishbein & Ajzen, 2010). Also, the existence of an ongoing student panel was a great advantage. We explored university students' intentions to be vaccinated and selected the most relevant determinants and their underlying beliefs to facilitate informed decision-making around COVID-19 vaccine uptake. We found that students' intention to be vaccinated is high (80% positive). Concerns about safety and side effects of the vaccine and trust in government, quality control,

and the pharmaceutical industry were identified as the most relevant determinants of vaccine intention (e.g., “I trust the quality control around the COVID-19 vaccine” or “I am worried about the safety of the COVID-19 vaccine”). Other predictors are risk perception (e.g., “I think that without vaccination, I might be at risk of contracting COVID-19”), attitude (e.g., “I think that getting the COVID-19 vaccine is a way out of this pandemic”), perceived norm (e.g., “I think that most people who are important to me want me to get the COVID-19 vaccination”), and self-efficacy beliefs (e.g., “I am confident that before I decide to get the COVID-19 vaccine, I will have sufficient information about the COVID-19 vaccine”).

Change Objectives

Change objectives are constructed by combining performance objectives with determinants; they form the most proximal intervention targets. Examples of change objectives are in this case: “Students state that they are not worried about the safety of the COVID-19 vaccine,” “Students recognize that their doctor/health care provider wants them to get the COVID-19 vaccination” or “Students indicate that it is easy for them to get the COVID-19 vaccine when it is their turn”. In Table 5.1 (also see Chapter 4), the selected change objectives are listed in the first column. Except for two change objectives about “concerns” (that are negative and supposed to decrease), all these objectives are positively formulated and are targeted for improvement (second column) as they were all correlated with the vaccination intention, and there was still room for improvement in those beliefs.

- Just-in-time: Step 2 needed empirical studies into the determinants of students’ vaccination intentions. The protocol for those kinds of study is clearly explained in the IM process. As the University already had a student panel, the study could be executed quite fast, helped by efficient decision-making at the level of the University management.

IM-STEP 3: Program Design

Theory- and Evidence-Based Change Methods and Practical Applications

In Table 5.1, the change objectives are linked to theory- and evidence-based change methods (third column). A change method is a defined process by which theories postulate, and empirical research provides evidence for, how change may occur: “a general technique for influencing the determinants of behaviors and environmental conditions.” In our case, we selected the change methods based on those as formulated

Table 5.1: Examples of pairing the relevant determinants with behavior-change methods to target in an intervention (from Chapter 4)

Determinant/Item	Change *	Method	Parameters
Risk Perception:			
Without vaccination, I might be at risk of contracting COVID-19	5.7 ↑	[Belief selection/done]	- self-efficacy improvement
If I contract COVID-19, the physical consequences for me would be severe	3.3 ↑	Consciousness raising	- gain frames
If I contract COVID-19, the social consequences for me would be severe	4.4 ↑	Framing Self-affirmation	- tailored to the individual
Concerns and trust:			
Concerns about the safety of the COVID-19 vaccine	3.3 ↓	Scenario-based risk info	- plausible cause-effect
Concerns about possible long-term negative side effects of the COVID-19 vaccine	3.9 ↓	Persuasive communication	- relevant, not-discrepant, arguments
The COVID-19 vaccine will be effective against new mutations of the virus	3.9 ↑	Tailoring	- interactive (if possible?)
I trust the government about ensuring the safety of the COVID-19 vaccine	5.0 ↑		
I trust the quality control around the COVID-19 vaccine	5.5 ↑		
I trust the pharmaceutical industry about the safety of the COVID-19 vaccine	4.7 ↑		
[Compared to current vaccines in the National Immunization Program:]			
I consider the COVID-19 vaccine equally safe	5.0 ↑		
I consider the COVID-19 vaccine equally effective	4.9 ↑		
I consider the COVID-19 vaccine equally trusted	4.5 ↑		
Attitude/Outcome expectations:			
By getting the COVID-19 vaccine, I can safely have more social contacts	5.3 ↑	-Shifting focus	- new reason (postponed reward)
I think that getting the COVID-19 vaccine is my moral duty	5.4 ↑	-Self-reevaluation	- self-image/high self-efficacy
I would feel guilty if I transmitted the virus if I decided not to get the vaccine	5.9 ↑	-Anticipated regret	- imagery/positive about avoiding negative consequences

Table 5.1: *Continued*

Determinant/Item	Change *	Method	Parameters
Perceived norm/Social influence:			
People like me will get the COVID-19 vaccination	5.5 ↑	Info about others'	- are present
My doctor/health care provider wants me to get the COVID-19 vaccination	5.4 ↑	approval	- commitment/values
People who are important to me want me to get the COVID-19 vaccination	5.6 ↑	Resistance to social pressure Mobilizing social support Modeling	- available; trust - reinforcement, identification, self-efficacy, coping
Self-efficacy/Perceived control:			
I am confident that I could get it when it is my turn	5.7 ↑	Modeling	- reinforcement, identification, self-efficacy, coping
It is easy for me to get the COVID-19 vaccine when it is my turn	5.5 ↑	Guided practice	- demonstration, instruction, enactment
I will have sufficient information about the COVID-19 vaccine	5.4 ↑	Planning coping responses	- identification and practice
I can always ask for more information from my general practitioner/PHS	5.6 ↑	Goal setting	- commitment to the goal
I am not concerned about possible local pain that could occur	5.4 ↑		
From the university:			
	Advocacy/active support	- matching style, consciousness raising/persuasion / approval	
	Technical assistance	- fit culture and resources	
	Mass-media role modeling	- appropriate models being reinforced	

* Numbers indicate the mean scores, and the direction of the arrow refers to the direction of the intended change.

by Bartholomew Eldredge et al. (2016, p. 347). An application is a way of organizing, operationalizing, and delivering the intervention methods: “delivery of the methods in ways that fit the intervention population and the context in which the intervention will be conducted” (p. 347). Translating methods into applications demands a sufficient understanding of the theory behind the method, that is the theoretical parameters that are necessary for the effectiveness of the theoretical process of change (fourth column in Table 5.1). For example, consciousness-raising may increase risk perception, but only when people have the skills and self-efficacy to counter the risk. Also, information about others’ approval may be highly influential, but only when those others indeed approve of the COVID-19 vaccination. All theoretical methods have these parameters and those need to be taken into account when the method is applied in real life.

Program Themes, Components, Scope, and Sequence

Earlier (Chapter 4), students indicated that they preferred science-based information from content experts, supported by high-level scientific publications, and not influenced by the pharmaceutical industry. Considering the important change objectives, the selected behavior-change methods, and the parameters for effectiveness, the actual intervention consisted of a series of videos on a special webpage of the University on COVID-19 directed at students. The final intervention included a series of four interviews, each with a student asking questions to an expert. The first two interviews were about risk perception and worries and trust, with two experts in clinical microbiology, and the second two were on attitudes and perceived norms with two experts in health promotion/health psychology. The third part about perceived control was covered with clear online instructions on how, where, and when to get the COVID-19 vaccine, especially targeting international students. Students also indicated that they wanted information about COVID-19 via emails pointing out information on the University’s website (Chapter 4). At all times, we made sure that the content of the videos (Table 5.2) covered all identified determinants (Table 5.1).

- Just-in-time: In Step 2, the information became available on the determinants of vaccination intentions, as well as the ways students preferred to be informed. For Step 3, the whole process of analyzing determinants, choosing methods, applying parameters, and producing applications was made easier by following the IM tasks specified for Step 3.

Table 5.2: Content of the questions that were asked of the four experts on video

These topics are covered in the interviews with the Maastricht UMC+ experts:

1. Risk for self & others - consequences for self & others

- *Most young people do not experience severe consequences from COVID-19, why should I bother?*
- *If I have already had COVID-19, do I still need to get vaccinated against COVID-19?*
- *How long will the COVID-19 vaccines provide protection?*
- *How well do vaccines prevent people from spreading the virus to others even if you do not have symptoms?*
- *How effective are the current vaccines against new variants/mutations?*

2. Safety & trust - long term & side effects, trust, mutations, quality control

- *How do we know that the vaccines are safe?*
- *How good is the quality control?*
- *What about side effects and what about long-term side effects?*
- *Can we trust the pharmaceutical industry?*

3. Easy vs practical difficulties

- *How easy is it to be vaccinated? → Refer to the local Public Health Service*

The next topics are covered in the interviews with the health promotion experts:

4. Reasons

- *Could you tell us about the main advantage of vaccination? Why would I take the vaccination?*
- *At this point, we see that more and more people have been vaccinated – also older people and people from at risk groups. Is it then for students still needed to be vaccinated? Why?*
- *If I take the vaccination, can I safely get back to normal have more social contacts? [in the long turn]*

5. Perceived norm

- *I have friends who do not want to take the vaccination*
- *Are UM students willing to be vaccinated? - These are of course promising numbers. However, they are numbers. Could you also share some personal stories with us – for instance, of colleagues or students that were vaccinated?*
- *Did you get vaccinated yourself and why? And what would be your advice for students?*

IM-STEP 4: Program Production

In IM-Step 4, the program structure and organization, materials, messages, pretesting and production are discussed. The interviews with experts from the University in the areas of vaccination and health promotion are the central element in the program. The video part of the program production was executed by the University's Video team, a semi-professional group of students that produce video components for the University's communication department; the input of these students also served as a simplified pretest of the program. The content of the questions asked by a student to the experts in the interviews was derived from the results of the earlier study on determinants (Table 5.1) and the intervention was in line with the results of the qualitative part of the determinants' study: all interviewees were introduced as experts in their scientific field (see Table 5.2).

The final program was a special COVID-19 webpage on the University's website: maastrichtuniversity.nl/um-covid-19. Students proceeded to: maastrichtuniversity.nl/study-safely-during-corona-crisis-1. There they could watch the developed videos: <https://youtu.be/0z27EvutqSo> and <https://youtu.be/KOIFIJNzgPM> (see Figure 5.2).

UM & COVID-19 vaccination

Maastricht University is doing everything to make sure we are safe at UM facilities. Soon, students can also get vaccinated against COVID-19. Maybe you have already received an invitation and made an appointment.

But maybe you are still looking for answers: Are the COVID-19 vaccines safe? What about the side effects? If you haven't received an invitation, how can you make an appointment to get vaccinated? This page provides information about the COVID-19 vaccination and examines on possible concerns.

Answers to your questions

We understand that you want to know more about the COVID-19 vaccines. We have created an FAQ page that offers answers (as far as possible) to the most frequently asked questions.

This list will be updated continuously. On this page, both Dutch and international students can find information about the practical aspects; how, where and when.

UM experts about the COVID-19 vaccine

Recently, Prof. dr. Paul Savelkoul - professor of Medical Microbiology and head of the Dept. of Medical Microbiology, dr. Astrid Oude Lashof - internist-infectologist at the Dept. of Medical Microbiology, prof. dr. Stef Kremers - professor of the Prevention of Obesity at the Dept. of Health Promotion, and Dr. Francine Schneider - assistance professor at the Dept. of Health Promotion, were interviewed on the importance of the COVID-19 vaccine and the facts and falsehoods that are being communicated on a daily basis.

In a series of video's, supported by scientific evidence, they do their utmost to answer all of the questions you might have.

Watch the two videos below.



Figure 5.2: Maastricht University (UM) & COVID-19 vaccination webpage.

Next to the newly developed videos, there were a series of videos from the “University of the Netherlands” on COVID-19. As those videos were in Dutch, they had been subtitled in English. These videos contained the same information by an expert but are also illustrated by clear animations.

- Just-in-time: The actual intervention could immediately be developed without any time lag, as the communication channels, experts from the Hospital and the University, and video producers were already available.

IM-STEP 5: Program Implementation Plan

In IM Step 5, adopters, implementers, and maintainers are identified, implementation objectives are stated, and implementation interventions are designed. Implementation is essential for reaching the objectives of an intervention (Fernandez et al., 2019b). Nevertheless, implementation is often an undervalued aspect of intervention planning as projects have a high chance to run into problems of no implementation or under-implementation. However, in this case, from the start, the intervention plan was approved and adopted by the leadership of the university. In collaboration with the University's Marketing and Communication Department, all services were provided to optimize timely implementation at the start of the summer holidays, just before that age group was eligible for being vaccinated.

- Just-in-time: All facilities for implementation were present and the necessary decision-making processes were followed without any time lag.

IM-STEP 6: Evaluation Plan

Ideally, first-time interventions are systematically developed and evaluated before they go out in the world. However, in times of COVID-19 where further delays were not desired, the systematic evaluation was deliberately skipped. This intervention was based on theory, on the expertise of the authors and communication professionals involved, and was the result of a fast, and just-in-time but still planned process of multidisciplinary inputs with strict timelines. The intervention was made public from the start. The number of views is registered and, knowing that this intervention has an expiration date, and that the situation will change, new interventions may be needed.

Discussion

Evidence-based health promotion interventions are usually developed by applying a systematic process of setting goals and objectives, using research, applying theoretical insights, and collecting data to confirm assumptions. However, in times of need, that process takes too long. Following the suggestions by Hanney et al. (2020), increasing resources, working in parallel, starting or working at risk, and improving processes,

the scientific process became shorter. By using IM as a protocol, we made sure that the essential decisions were made in the right order while still using theory and research as optimal as possible. In the following section, we will discuss our lessons learned from implementing the IM protocol.

Lesson 1: Build a Mutual Trust Relationship Between Relevant Stakeholders and Implementers. The whole process is depending on the trust of those in charge (in this case the leadership of the University) in the competency of the developers. For decision-makers: make sure to include people whose track record you know and who you trust. For implementers: make sure that the people in charge know your expertise in theory- and evidence-based intervention development and implementation.

Lesson 2: Make Use of Theory and Core Processes. Theory-testing is not part of this process; this is all about applying theory in a problem-driven context. Especially when time is limited, and therefore research is not always possible, applying theories is the best alternative. One way to systematically apply theories is described in the so-called Core Processes (Ruiter & Crutzen, 2020): (1) pose questions, (2) brainstorm answers, (3) review research, (4) find theoretical support, (5) find empirical support, and (6) complete the list of answers. In Step 4, the planners search for theories, first to understand and then to solve the problem. Core Processes provide a protocol for finding the empirical support and theoretical support that help to quickly formulate appropriate answers to planning questions.

Lesson 3: Apply IM. IM helps with detailed note-taking of the decision-making process in intervention development and design, for example what is the risky and what is the safe behavior, what environmental conditions contribute to the problem, who are responsible, what are the determinants of behavior, how can we change those determinants in the desired direction by an intervention, how can we implement the change program, and how can we measure the final outcomes?

Lesson 4: Make Use of Evidence from Related Fields. If there is a lack of evidence around the problem, it can be helpful to rely on evidence from related or comparable fields. For example, in Step 3 of the IM process described earlier, the review of empirical findings from published research was limited to articles on other comparable infectious diseases and vaccination programs, such as with influenza or measles, as relevant articles on COVID-19 were not yet available. As a result, the careful application of relevant theories, in a setting of group discussions with experts, formed the basis for “theory- and evidence-based” program development.

Lesson 5: Make Use of Evidence from the Past and the Present. Several theory-informed methods (and their parameters for effective application) are identified in the past (Bartholomew Eldredge et al., 2016) that could form the basis of interventions.

Here, the identified outcomes, performance objectives, determinants, and change objectives for COVID-19 vaccination acceptance were based on theory and a present survey among the students. This survey provided adequate information about concerns and trust, risk perception, attitudinal beliefs, perceived norms, and self-efficacy beliefs to select the relevant change objectives for the intervention (Table 5.1). Subsequently, these were linked to the intervention application(s), derived from the earlier identified theory-based methods (Table 5.1). Given the setting, the target population, and the needs, in IM-Step 3 (program design) an online intervention was chosen as the most efficient way to reach the students.

Lesson 6: Identify and Involve All Relevant Stakeholders. It is helpful to identify and involve all stakeholders related to the problem (in this case university students) and solution (experts)—throughout the entire process of intervention development. The focus of the intervention was on science-based information which the students had indicated as the most trustworthy and informative. Therefore, in IM-Step 4, the program design, the major element consisted of four interviews, each with an expert from our own university or academic hospital, discussing the medical aspects: risk for self and others, safety and trust, such as mutations and side effects, and the societal aspects: reasons for taking the vaccination and the interaction with the social environment. We deliberately had a “student asking questions of the experts,” as a voice of all other students. Next to that, the website provides general information about COVID-19 and information about the arrangements at the University for studying in times of COVID-19.

Lesson 7: Implementation Can Be More Urgent Than Evaluation or Effect Measures. Often, when there is no time for a randomized controlled study to test the intervention, implementation takes precedence. In this case, the implementation plan was relatively easy, as the University was very helpful and provided all necessary support. The intervention was implemented as soon as it was finished, to promote that students would respond positively to the vaccination invitations that were sent out at that moment in time. IM-Step 6, the evaluation plan, was not executed as the focus was on the moment, and even 1 year later the situation could have changed to a future where everything could be different (e.g., new variants of the virus) and new interventions would be needed.

Conclusion

The COVID-19 crisis teaches us that there are ways to speed up intervention development and implementation, without losing scientific rigor. The current project was executed under unavoidable time pressure. Nevertheless, IM provided a structure and a process that helped us develop an intervention that hopefully will positively affect students' vaccination behavior in times of need. We also applied Hanney et al.'s (2020) suggestion about the four ways to speed up the development and implementation of an intervention. For our intervention, increasing resources involved (1) concrete support from the University and the National Institute for Public Health, (2) funding of the survey among students, and (3) fast and full implementation of the intervention. Working in parallel involved: overlap of the IM-steps as indicated in Figure 5.1. Working at risk involved (1) using evidence from related fields, (2) applying theories to new processes, (3) deciding by expert consensus, and (4) implementing an intervention without evidence for effectiveness. Improving processes involved (1) accelerating procedures, (2) using an existing panel of students, (3) collaborating intensively with the department of Marketing and Communication, and (4) following the IM protocol as efficiently as possible. IM was a helpful guide to ensure scientific rigor and quality, while shortening the time between research and application, creating a just-in-time but still planned theory- and evidence-based intervention.

References

- Bartholomew Eldredge, L. K., Markham, C. M., Ruiter, R. A. C., Fernández, M. E., Kok, G., & Parcel, G. S. (2016). *Planning health promotion programs: An Intervention Mapping approach*. John Wiley & Sons.
- Ciotti, M., Ciccozzi, M., Terrinoni, A., Jiang, W., Wang, C., & Bernardini, S. (2020). The COVID-19 pandemic. *Critical Reviews in Clinical Laboratory Sciences*, 57(6), 365–388. <https://doi.org/10.1080/10408363.2020.1783198>
- daCosta DiBonaventura, M., & Chapman, G. B. (2005). Moderators of the intention–behavior relationship in influenza vaccinations: Intention stability and unforeseen barriers. *Psychology & Health*, 20(6), 761–774.
- Fall, E., Izaute, M., & Chakroun-Baggioni, N. (2018). How can the health belief model and self-determination theory predict both influenza vaccination and vaccination intention? A longitudinal study among university students. *Psychology & Health*, 33(6), 746–764.
- Fernandez, M. E., Ruiter, R. A. C., Markham, C. M., & Kok, G. (2019a). Intervention Mapping—Theory-and evidence-based health promotion program planning: Perspective and examples. *Frontiers in Public Health*, 7, Article 209. <https://doi.org/10.3389/fpubh.2019.00209>
- Fernandez, M. E., ten Hoor, G. A., van Lieshout, S., Rodriguez, S. A., Beidas, R. S., Parcel, G., ... Kok, G. (2019b). Implementation mapping: Using Intervention Mapping to develop implementation strategies. *Frontiers in Public Health*, 7, Article 158177. <https://doi.org/10.3389/fpubh.2019.00158>
- Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. Taylor & Francis.
- Government of the Netherlands. (2022). *Coronavirus 2019— COVID-19*. <https://www.government.nl/topics/coronavirus-covid-19>
- Hanney, S. R., Castle-Clarke, S., Grant, J., Guthrie, S., Henshall, C., Mestre-Ferrandiz, J., ... Wooding, S. (2015). How long does biomedical research take? Studying the time taken between biomedical and health research and its translation into products, policy, and practice. *Health Research Policy and Systems*, 13(1), 1–18. <https://doi.org/10.1186/1478-4505-13-1>
- Hanney, S. R., Wooding, S., Sussex, J., & Grant, J. (2020). From COVID-19 research to vaccine application: Why might it take 17 months not 17 years and what are the wider lessons? *Health Research Policy and Systems*, 18, 1–10. <https://link.springer.com/content/pdf/10.1186/s12961-020-00571-3.pdf>
- Kok, G., Gottlieb, N. H., Peters, G. J. Y., Mullen, P. D., Parcel, G. S., Ruiter, R. A. C., Fernandez, M. E., Markham, C., & Bartholomew, L. K. (2016). A taxonomy of behaviour change methods: An Intervention Mapping approach. *Health Psychology Review*, 10(3), 297–312. <https://doi.org/10.1080/17437199.2015.1077155>
- Kwasnicka, D., ten Hoor, G. A., Hekler, E., Hagger, M. S., & Kok, G. (2021). Proposing a new approach to funding behavioural interventions using iterative methods. *Psychology & Health*, 36(7), 787–791. <https://doi.org/10.1080/08870446.2021.1945061>
- Morris, Z. S., Wooding, S., & Grant, J. (2011). The answer is 17 years, what is the question: Understanding time lags in translational research. *Journal of the Royal Society of Medicine*, 104(12), 510–520. <https://doi.org/10.1258/jrsm.2011.110180>
- Rijksinstituut voor Volksgezondheid en Milieu (National Institute for Public Health and the Environment) (2021). *Cijfers COVID-19 vaccinatieprogramma*. <https://www.rivm.nl/covid-19-vaccinatie/cijfers-vaccinatieprogramma>

- Ruiter, R. A. C., & Crutzen, R. (2020). Core processes: How to use evidence, theories, and research in planning behavior change interventions. *Frontiers in Public Health*, 8, Article 247. <https://www.frontiersin.org/articles/10.3389/fpubh.2020.00247/full>
- Vivion, M., Hennequin, C., Verger, P., & Dubé, E. (2020). Supporting informed decision-making about vaccination: an analysis of two official websites. *Public Health*, 178, 112–119. <https://pubmed.ncbi.nlm.nih.gov/31675549/>
- World Health Organization. (2020). *Novel Coronavirus 2019 vaccines*. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19-vaccines>

Chapter 6

A Safe Return to Campus in Times of
COVID-19: A Survey Study among
University Personnel to Inform Decision
Makers

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Abstract

Halfway through 2021 in the midst of a public health crisis, a new academic year was fast approaching. Dutch universities were preparing to reopen their campuses to students and personnel in a safe manner. As the vaccination uptake was increasing and societies were slowly reopening, inviting students and personnel to campus became the next step to “the new normal”. To absorb this change seamlessly, it was considered important to investigate personnel’s beliefs about returning to campus and their perceptions of a safe working environment. An online survey was conducted among personnel ($N = 1965$) of Maastricht University, the Netherlands. University personnel’s beliefs about a safe return to campus were assessed. The data were collected between 11 June and 28 June 2021. This study showed that, while most personnel (94.7%) were already vaccinated or willing to do so, not all personnel did feel safe to return to campus in September 2021. Over half of the respondents (58%) thought that the university is a safe place to return to work when the new academic year starts. However, the remainder of personnel felt unsafe or were uncertain for various reasons such as meeting in large groups or becoming infected. Moreover, when returning to campus, employees stated that they would require some time to reacclimate to their former work culture. The group who felt relatively more unsafe indicated that returning in September was too risky and that they worried about being infected. They wanted the safety guidelines to still be in force. On the other hand, the “safe” group stated safely returning to be “certainly possible” and trusted that others would still stick to the prevention guidelines. The findings led to practical recommendations for the University Board as they were preparing for organizing research and teaching for the upcoming academic year in the context of the COVID-19 pandemic. A brief intervention was developed: a webinar in which the data were linked to the board’s plans for safe returning. This study demonstrates that university boards may use research among personnel to develop adequate measures promoting safety and feelings of safety among personnel in similar future situations.

Keywords: COVID-19; university personnel; beliefs; safety; vaccination; return to work

Introduction

Since the start of the COVID-19 pandemic, governments have been implementing mitigation rules to curb the number of COVID-19 cases and hospitalizations. Among those rules, the closure of higher educational institutions was implemented worldwide, which led many universities to switch to online education in order to prevent disruption in students' learning (Adedoyin & Soykan, 2020; Ebrahim et al., 2020). In the Netherlands, Dutch universities, including Maastricht University (UM), chose to offer hybrid education at the start of the academic year 2020–2021. However, in November 2020, with a steep rise in the number of COVID-19 cases, all universities had to move their education to fully online. At this time (November 2020), stage-wise COVID-19 vaccination was offered to everyone living in the Netherlands. The Dutch government aimed at vaccinating everyone over the age of 18 who was willing to get vaccinated against COVID-19 by September 2021 (Séveno, 2021).

As the new academic year (1 September 2021–31 August 2022) was approaching, Dutch universities were eager to welcome students back to the campus after summer, if allowed by the government, in light of the increase in the COVID-19 vaccination uptake (in the week of 11 May 2021, 84% of all people over the age of 16 were vaccinated or willing to vaccinate soon) and the fall in the number of positive COVID-19 cases and hospitalizations in May 2021 (National Institute for Public Health and the Environment, 2021). Brammer and Clark (2020) shared their reflections concerning the impact of the COVID-19 pandemic on students and university personnel. They stated that the uncertainties, concerns, and increased workload posed by COVID-19 caused stress and anxiety among students and personnel. Due to the adverse effect of the COVID-19 pandemic on the education and wellbeing of students and staff (Burns et al., 2020; de Oliveira Araújo et al., 2020; Sahu, 2020), universities were looking for secure methods to welcome students and university personnel back to their campuses in September 2021.

Problem solving and policy development require a thorough understanding of the problem. Intervention mapping, a framework for theory- and evidence-based program development at different environmental levels, embraces the involvement of stakeholders in the problem diagnosis and planning for the solution (Belansky et al., 2011; Byrd et al., 2012; Fernandez et al., 2019). As higher education institutes are not only home for students but also for university personnel, their perspectives were deemed important by the Board of UM in order to facilitate a smooth transition to work on-site, create a safe environment, and optimize vaccination decision making.

In this exploratory study among UM personnel, the aim was to collect data to assist the university executive board's policy/decision making. For this, we explored the feelings of safety of university personnel when trying to imagine returning to UM in September by asking them about (a) positive and negative attitude beliefs, (b) trust and worries, and (c) preventive measures, especially COVID-19 vaccination uptake. The findings of this study helped the University Board to respond to the upcoming reopening of the university, and the study procedures may be reused for comparable pandemic and epidemic threats in the future.

Methods

Procedure and Participants

Personnel ($N = 7198$) of the university including both academic personnel and support staff, such as policy managers, secretaries, and IT experts working at the university, were invited to participate in the study through two channels: (1) an existing employee panel of the university operated by a certified survey agency (Flycatcher; <https://www.flycatcher.eu/en/Home/OverOns>, accessed on 27 January 2022), and (2) an email that was sent on behalf of the executive board to all personnel.

An online survey was used to collect information, which began on 11 June and ended on 28 June 2021. One reminder was sent out on 21 June. First, all panel members were emailed a unique hyperlink. Subsequently, a general hyperlink was emailed to all personnel; personnel who were members of the panel were instructed to use the URL provided by the survey agency. Participants agreed to participate in the study by clicking on the hyperlink included in the invitation and the agreement box before they could begin the questionnaire. This study was approved by the Ethics Review Committee, Psychology and Neuroscience, Maastricht University, ERC PN: 188_10_02_2018_S68.

Measurements

The focus of this cross-sectional study was to explore (1) whether university personnel would feel safe when imagining returning to campus in the new academic year (2021) and (2) the relevant safety beliefs (or exploratory constructs) split into (a) positive and negative attitude beliefs, (b) trust and worries, and (c) thoughts on preventive measures including COVID-19 vaccination uptake.

Preparation. The questionnaire was developed based on the available literature, theory, and the information gathered through interviews among university personnel

(Ruiter & Crutzen, 2020). In the preparation of this study, our search for literature on university personnel's sense of safety upon returning to work yielded no results. However, there was literature on COVID-19 vaccination or vaccination intention in general (Daly & Robinson, 2021; Dror et al., 2020; Neumann-Böhme et al., 2020; Quinn et al., 2019; Taylor et al., 2020), as well as on people's responses to fear appeals (Ruiter et al., 2014). Further, the construction of the questionnaire was guided by social cognitive theories (Ajzen, 2015; Bandura, 2001; Fishbein & Ajzen, 2010; Maddux & Rogers, 1983) as well as the online interviews that were conducted with UM personnel ($N = 8$; unpublished data). In the interviews, personnel were asked their opinions about the safety of the work environment when returning to campus in September 2021, as well as about the COVID-19 vaccines.

The questionnaire was reviewed by several experts and revised based on the feedback received. Both English and Dutch versions of the questionnaire were available for personnel to fill out. The Supplementary Materials contains the complete questionnaire, File 1. The questionnaire and Supplementary Materials can be found at the Open Science Framework: <https://osf.io/fzep9/>. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational studies were used while reporting this study (Von Elm et al., 2007).

Returning to campus in September. Participants were asked, "When I try to imagine the situation in September, I think that UM is a safe place to return to". A 7-point Likert scale (fully disagree (1)–fully agree (7)) was provided as the answer option.

Positive and negative attitude beliefs were measured with ten belief questions. Example items are: "Starting again in September full-on . . . is too fast/requires a transition period/is too risky/means that I have to protect myself against others"; "Returning to "normal in September" is certainly possible"; and "I am happy that I can see my colleagues in real life again". All questions were responded to on 7-point Likert scales (fully disagree (1)–fully agree (7)), and for certain questions, a "not applicable" option was included.

Trust and worries comprised eight belief questions, for instance, "I trust that UM will be a safe place in terms of people sticking to the prevention rules" and "I am worried about students and staff returning from high-risk countries" with the answer option (Likert scale): fully disagree (1)–fully agree (7). For some questions, a "not applicable" answer option was included.

Preventive measures entailed questions regarding facilities (2 items), entrance testing proof (2 items), safety guidelines (2 items), and people with health complaints (3 items). A 7-point Likert scale (fully disagree (1)–fully agree (7)) was used as the answer option. One exception in terms of response option was for "entrance testing" items: "I think that asking people to show entrance testing proof, or to do a test, is" (1):

not feasible at all (1)—very feasible (7); and (2): not useful at all (1)—very useful (7). (Note: for entrance to restaurants, events, or other activities/buildings, a mandatory test was suggested, where people had to show that they are vaccinated, recovered from a recent COVID-19 infection, or tested negative for the coronavirus).

COVID-19 vaccination intention and/or behavior was measured with the item “I have been vaccinated against COVID-19”. The response options were (1) yes, fully; (2) yes, partially; and (3) no. Participants who chose “no” continued with the question “You indicated that you have not (yet) been vaccinated. Which of the following statements is most applicable to you?”, with four response options: (1) “I intend to take the vaccine when it is my turn”; (2) “I have not been vaccinated and decided to not take the vaccine when it was my turn”; (3) “I do not intend to take the vaccine”; and lastly (4) “I do not know yet whether I want to get vaccinated”. Vaccination beliefs were assessed by including 18 items, with a 7-point Likert scale (fully disagree (1)—fully agree (7)) response option.

Demographics included age, gender, how long they have been employed by the university, whether they work full-time or part-time, their function at the university (“teaching and research”; “academic support, policy and management”; and “other” (not further specified)), where they work (“a faculty”; “a service center”; and “other”), and whether they see themselves as a member of a high-risk group for COVID-19 (“yes”; “no”; and “I do not know”).

Data Analysis

For all items, descriptive analysis was conducted to calculate the means (M), standard deviations (SD), and frequencies by using IBM SPSS Statistics 26. There were no missing data. In the preliminary analyses, we found that the members of the Flycatcher panel and the personnel group had quite similar outcomes. Given the comparable results, we did not differentiate between the Flycatcher panel members versus the other UM personnel in the data analysis.

Correlations between the question “When I try to imagine the situation in September, I think that UM is a safe place to return to” and all potential underlying beliefs were calculated for positive and negative attitude beliefs, trust and worries, and preventive measures. Additionally, we performed ANOVA with the Welch statistic (with post hoc Games–Howell test) to characterize three groups: unsafe, neutral, and safe.

Vaccination behavior/intention was grouped into three categories (yes, no, and do not know): “Yes, fully”, “Yes, partially”, and “I intend to take the vaccine when it is my turn” was grouped as “yes” ($N = 1860$); “I have not been vaccinated and decided to not take the vaccine when it was my turn”, and “I do not intend to take the vaccine” were

grouped as “no” ($N = 39$); and “I do not know yet whether I want to get vaccinated” was grouped as “do not know” ($N = 66$). For vaccination beliefs, in order to compare the mean scores of the “yes”, “no”, and “do not know” groups, we started off by running ANOVA with the Welch statistic (Delacre et al., 2019). Subsequently, to detect which means differ from one another, we proceeded with a post hoc (Games–Howell) test. In order to examine whether the vaccination was also a factor in people’s beliefs about returning to work safely in September, we compared the results of the returning to campus questions with the results of the vaccination questions by using crosstab analysis.

Results

Demographics

Of the 7198 invited people, a total of 1965 personnel (27.3% response rate; 62.2% female) completed the survey; 21.5% of participants were in the age group of 56–65 or older than 65, and 14.4% identified themselves as a member of a high-risk group. Full background characteristics of the sample can be found in Table 6.1. Demographic characteristics of the participants of the survey and the total UM population were highly comparable.

Table 6.1: Demographic characteristics of the participants ($N = 1965$) and comparison with population (UM)

Age	Participants	UM	Full-time?	Participants	UM
16–25	3.8%	5.1%	Yes	63.6%	60.0%
26–35	25.9%	34.1%	No	36.4%	40.0%
36–45	25.8%	23.8%			
46–55	23.2%	18.6%			
56–65	20.2%	17.7%			
>65	1.3%	0.8%			
Gender			Work in		
Female	62.2%	56.6%	A faculty	74.3%	80.3%
Male	35.2%	43.4%	A service center	22.3%	14.3%
Other	0.3%		Other	3.4%	5.3%
I do not want to answer	2.3%				
Working at UM for			Being a member of high-risk group		
< 2 years	15%	22.9%	Yes	14.4%	
2–5 years	21.9%	29.1%	No	78.4%	
6–10 years	13.9%	12.8%	I do not know	7.3%	
>10 years	49.2%	53.3%			
Function					
Teaching & research	45.9%	56.7%			
Academic support, policy & management	50.6%	43.3%			
Other	3.6%				

Beliefs of University Personnel about a Safe Return to Campus

Of all personnel, 58.3% (score 5–7) indicated that Maastricht University is a safe place to return to work in September, while 23.9% (score 1–3) found the university not safe to return to in September 2021 (17.8% was undecided—score 4). The mean score was 4.63 (1–7) with a standard deviation of 1.64.

Negative and Positive Attitude Beliefs about Returning to Campus in September

Of the 1965 participants, 32.4% found starting again in September full-on too fast, and 28.2% indicated that it is too risky, while 43.2% indicated that returning to normal in September is certainly possible. Moreover, 48.3% stated that they have to protect themselves against others when they start working full-on in September, 65.1% thought that in order to start again in September full-on they require a transition period, and 41.5% were afraid that there will be too many adjustments for them when returning to campus. However, most of the participants stated that they can deal with being back in the office again. They were happy that they can start working at the office again (65.8%), that they can see their colleagues again (85.1%) and will have contact with students in real life again (74.9%).

All items were significantly correlated with “When I try to imagine the situation in September, I think that UM is a safe place to return to”. For all attitude beliefs, the “feeling unsafe” group is significantly more negative than the neutral group, while the “feeling safe” group is significantly more positive than the neutral group. The largest correlations with starting again in September are: “too risky”, ($r = -0.73$), as negative belief, and “is certainly possible”, ($r = 0.66$), as positive belief (See Table 6.2).

Trust and Worries about Returning to Campus in September

Personnel stated that the university will be a safe place in terms of people sticking to the prevention rules (61.9%) and facilities such as ventilation and disinfectants (73.7%). The main worry of the personnel was about meeting in large groups (63.3%), followed by students and staff returning from high-risk countries (61.8%) and being worried about how to deal with vaccine deniers/refusers (58.5%). Half of the participants indicated they are worried about becoming infected by COVID-19. *Ms* and *SDs* can be found in Table 6.2. For all beliefs on trust and worries, the feeling “unsafe” group is significantly more worried and less trusting than the neutral group, while the feeling “safe” group is significantly more trusting and less worried than the neutral group. The largest correlations with starting again in September are: “people sticking to the prevention rules” ($r = 0.65$), as trust belief, and “I still worry about being infected”, ($r = -0.62$), as worry belief (See Table 6.2).

Table 6.2: Beliefs (returning to campus in September, trust and worries, and the precautions to prevent the spread of COVID-19), mean scores and the correlation with ‘When I try to imagine the situation in September, I think that UM is a safe place to return to’ (N = 1965)

	Total Group M (SD) (N = 1965)	Total Group r (N = 1965)	Total Group F (N = 1965)	Unsafe (1-3) M (N = 472)	Neutral (4) M (N = 349)	Safe (5-7) M (N = 1144)
Fully disagree (1) – Fully agree (7)						
<i>Attitude: negative beliefs</i>						
Starting again in September full-on is too fast.	3.54 (1.97)	-.62**	429.39**	5.23 ^a	4.10 ^b	2.68 ^c
Starting again in September full-on requires a transition period.	4.96 (1.96)	-.54**	342.42**	6.25 ^a	5.70 ^b	4.20 ^c
Starting again in September full-on is too risky.	3.45 (1.80)	-.73**	646.86**	5.25 ^a	4.05 ^b	2.52 ^c
Starting again in September full-on means that I have to protect myself against others.	4.21 (1.97)	-.61**	484.67**	5.88 ^a	4.77 ^b	3.36 ^c
I am afraid there will be too many adjustments for me when we return on campus in September.	3.81 (2.01)	-.46**	198.03**	4.96 ^a	4.51 ^b	3.12 ^c
<i>Attitude: positive beliefs</i>						
Returning to normal in September is certainly possible.	4.03 (1.89)	.66**	522.50**	2.40 ^a	3.36 ^b	4.91 ^c
I am happy that I can start working at the office again.	5.12 (1.71)	.61**	380.81**	3.71 ^a	4.56 ^b	5.88 ^c
I am happy that I can see my colleagues in real life again.	5.87 (1.40)	.49**	175.36**	4.93 ^a	5.58 ^b	6.35 ^c
I am happy that I have contact with students in real life again.†	5.45 (1.63)	.54**	166.82**	4.24 ^a	5.23 ^b	6.08 ^c
I think I can deal with being back in the office again.	5.37 (1.60)	.65**	421.42**	3.90 ^a	4.92 ^b	6.11 ^c
<i>Trust</i>						
I trust that UM will be a safe place in terms of people sticking to the prevention rules.	4.78 (1.76)	.65**	437.35**	3.09 ^a	4.47 ^b	5.57 ^c
I trust that UM will be a safe place in terms of facilities (ventilation, disinfectants).	5.20 (1.67)	.60**	310.95**	3.70 ^a	5.00 ^b	5.88 ^c
<i>Worries</i>						
I am worried about students and staff returning from high-risk countries.	4.81 (1.87)	-.52**	271.90**	6.04 ^a	5.39 ^b	4.13 ^c
I am worried about how to deal with vaccine deniers/refusers.	4.72 (1.96)	-.37**	110.36**	5.62 ^a	5.16 ^b	4.21 ^c
I am worried about meeting in large groups.	4.88 (1.89)	-.59**	429.95**	6.30 ^a	5.63 ^b	4.07 ^c
I am worried about my roommate(s) not being as careful as I am.††	3.48 (2.09)	-.53**	192.85**	4.99 ^a	4.01 ^b	2.73 ^c
I think that there is too much pressure on us to be ‘on-site’ all the time.	4.16 (2.11)	-.59**	390.37**	5.81 ^a	4.81 ^b	3.29 ^c
The situation with COVID-19 has improved, but I still worry about being infected.	4.28 (1.96)	-.62**	478.92**	5.85 ^a	5.11 ^b	3.38 ^c

Table 6.2 continues on next page.

Table 6.2: *Continued*

	Total Group <i>M</i> (<i>SD</i>) (<i>N</i> = 1965)	Total Group <i>r</i> (<i>N</i> = 1965)	Total Group <i>F</i> (<i>N</i> = 1965)	Unsafe (1–3) <i>M</i> (<i>N</i> = 472)	Neutral (4) <i>M</i> (<i>N</i> = 349)	Safe (5–7) <i>M</i> (<i>N</i> = 1144)
Fully disagree (1) – Fully agree (7)						
<i>Facilities</i>						
I am sure that the ventilation at work is good enough to prevent becoming infected.	3.45 (1.71)	.49**	238.68**	2.32 ^a	3.07 ^b	4.03 ^c
The rules about ventilation in our buildings are not clear.	4.53 (1.71)	-.32**	80.31**	5.28 ^a	4.73 ^b	4.16 ^c
<i>Preventive measures: Entrance testing proof</i>						
I think that asking people to show entrance testing proof, or to do a test, is not feasible at all – very feasible	3.43 (1.99)	-.007	.02	3.42 ^a	3.45 ^a	3.43 ^a
I think that asking people to show entrance testing proof, or to do a test, is not useful at all – very useful	4.26 (1.94)	-.16**	15.14**	4.65 ^a	4.40 ^a	4.07 ^b
<i>Safety guidelines</i>						
In my view the 'keeping 1.5m distance' guideline should still be implemented in September, for safety.	4.98 (1.82)	-.52**	302.37**	6.22 ^a	5.52 ^b	4.31 ^c
In my view the 'wearing a face mask' guideline should still be implemented in September, for safety.	4.35 (2.05)	-.50**	233.87**	5.73 ^a	4.80 ^b	3.65 ^c
<i>Dealing with health complaints</i>						
People who are sniffing or coughing should stay at home and not visit the campus.	5.95 (1.45)	-.29**	79.07**	6.50 ^a	6.12 ^b	5.67 ^c
People who are sniffing or coughing on campus should be send home.	5.52 (1.71)	-.33**	101.41**	6.26 ^a	5.76 ^b	5.14 ^c
UM should provide clear guidelines about how we should deal with students who have health complaints.	6.17 (1.12)	-.24**	54.12**	6.54 ^a	6.31 ^b	5.98 ^c

† 30.6% of participants responded as 'not applicable' as they have no contact with students. When calculating the frequencies, not applicable (8) cases were not included in the analysis.

†† 18.4% of participants responded 'not applicable'. When calculating the frequencies, not applicable (8) cases were not included in the analysis.

** $p < .001$; * $p < .01$.

The statistically significant mean differences were indicated with letters (i.e., a, b, c). Each letter was used only once to show the significant difference in the means. The significance level is $p < .05$.

Preventive Measures Related to Returning to Campus in September

The ventilation at work was perceived to be good enough to prevent becoming infected by 26.7% of personnel, while half of the participants indicated that the rules about ventilation in the buildings are not clear. Asking people to show entrance testing proof, or to do a test, was found to be not feasible by 54.9%, but to be useful by 46.8% of participants. In terms of the rules that should still be implemented in September, distancing (64%) and facemask (49.4%) rules were viewed as necessary by (more than) half of the personnel. In case people (personnel and students) have symptoms such as sniffing or coughing, 84.5% of personnel stated that these people should stay at home and should not come to campus, and if people are sniffing or coughing on campus, 74.6% stated that they should be sent home. Almost all participants (90.6%) indicated that the university should provide clear guidelines about how to deal with students who have health complaints.

The differences between the “unsafe”, “neutral” and “safe” groups for all beliefs can be found in Table 6.2. The largest correlations with starting again in September are the statements about safety guidelines, “still keeping 1.5m distance” ($r = -0.52$), and “still wearing a facemask” ($r = -0.50$). Surprising were the results of asking for entrance testing proof: “not useful” ($r = -0.16$), and “not feasible” ($r = -0.01$), meaning that, at that time, personnel’s views on entrance testing proof were not related to their feelings of safety on returning to work.

COVID-19 Vaccination Uptake and Beliefs

Of 1965 personnel, 1860 (94.7%) indicated that they are either already vaccinated against COVID-19, or they are willing to do so. Only 2% had decided not to take the vaccine when it was their turn or did not intend to get the vaccine (and 3.4% were undecided). The vaccination beliefs of university personnel are depicted in Table 6.3. The mean scores of COVID-19 vaccination beliefs for each of the three groups (“yes”, “no”, “do not know”) differed significantly. Most personnel thought that being vaccinated against COVID-19 is the only way out of this pandemic (85.4%) and vaccination gives a feeling of safety (86.2%). Personnel (60.2%), also including those who already received a COVID-19 vaccine or intend to do so, did not agree with the statement that being vaccinated against COVID-19 does make it 100% safe. Moreover, most personnel (88.2%) thought that being vaccinated against COVID-19 would result in people keeping less distance from others.

Personnel who already received a COVID-19 vaccine or did intend to do so (“yes” group: $M = 2.75$; $SD = 1.66$) were not as worried about the safety of the COVID-19

Table 6.3: Beliefs about vaccination and mean scores of the total group, yes (vaccinated or intend to), no (decided not to get vaccinated or not intend to), and don't know groups (N = 1965)

	Total Group M (SD) (N = 1965)	F	Yes M (N = 1860, 94.7%)	Don't Know M (N = 66, 3.4%)	No M (N = 39, 2.0%)
Fully disagree (1) – fully agree (7)					
<i>Risk perception:</i> Without vaccination, I might be at risk of contracting COVID-19.	5.94 (1.48)	90.75*	6.08 ^a	3.73 ^b	3.15 ^b
<i>Attitude:</i> Being vaccinated against COVID-19 is the only way out of this epidemic.	5.91 (1.51)	295.39*	6.11 ^a	2.77 ^b	1.82 ^c
<i>Attitude:</i> Being vaccinated against COVID-19 gives a feeling of safety.	5.84 (1.44)	240.30*	6.02 ^a	3.03 ^b	1.79 ^c
<i>Attitude:</i> Being vaccinated against COVID-19 leads to less negative consequences when you might be infected.	6.18 (1.22)	104.70*	6.31 ^a	4.23 ^b	3.00 ^c
<i>Attitude:</i> Being vaccinated against COVID-19 makes it 100% safe.	3.09 (1.78)	68.48*	3.17 ^a	2.02 ^b	1.44 ^c
<i>Attitude:</i> Being vaccinated against COVID-19 will lead to people keeping less distancing from others.	5.78 (1.20)	5.14*	5.81 ^a	5.45 ^{ab}	4.82 ^b
<i>Attitude:</i> Vaccination is a personal and private choice; we cannot force people to take it.	5.02 (2.03)	125.43*	4.92 ^a	6.68 ^b	6.72 ^b
<i>Attitude:</i> We don't know how long the effect of vaccination against COVID-19 will last.	6.10 (1.14)	15.13*	6.08 ^a	6.62 ^b	6.46 ^{ab}
<i>Attitude:</i> UM should give more information about vaccination to international personnel and students.	5.04 (1.59)	12.77*	5.08 ^a	4.41 ^b	3.82 ^b
<i>Attitude:</i> I am worried about the safety of the COVID-19 vaccine.	2.93 (1.80)	436.67*	2.75 ^a	5.83 ^b	6.51 ^c
<i>Attitude:</i> I am worried about possible long-term negative side effects of the COVID-19 vaccine.	3.12 (1.90)	668.35*	2.93 ^a	6.20 ^b	6.67 ^c
<i>Attitude:</i> The COVID-19 vaccine will be likely effective against new mutations of the virus.	4.14 (1.33)	48.62*	4.21 ^a	3.21 ^b	2.36 ^c
<i>Attitude:</i> I trust the government about ensuring the safety of the COVID-19 vaccine.	5.10 (1.58)	102.74*	5.23 ^a	3.12 ^b	2.26 ^c
<i>Attitude:</i> By getting the COVID-19 vaccine, I can safely have more social contacts.	5.36 (1.37)	135.64*	5.49 ^a	3.48 ^b	2.15 ^c
<i>Attitude:</i> I think that getting the COVID-19 vaccine is my moral duty.	5.73 (1.72)	273.23*	5.93 ^a	2.20 ^b	2.03 ^b
<i>Attitude:</i> I would feel guilty if I transmitted the coronavirus because I had decided not getting the vaccine.	6.14 (1.48)	147.51*	6.32 ^a	3.09 ^b	2.54 ^b
<i>Social norm:</i> Most people like me will get the COVID-19 vaccination.	6.03 (1.28)	192.60*	6.20 ^a	3.41 ^b	2.33 ^c
<i>Social norm:</i> Most people who are important for me, want me to get the COVID-19 vaccination.	5.80 (1.59)	138.68*	5.95 ^a	3.21 ^b	2.69 ^b

* $p < .01$

The statistically significant mean differences were indicated with letters (i.e., a, b, c). The significance level is $p < .05$.

vaccine as people who decided not to get vaccinated against COVID-19 or who did not intend to do so (“no” group: $M = 6.51$; $SD = 1.02$) and people who were undecided to get vaccinated (“do not know” group: $M = 5.83$; $SD = 1.16$). Likewise, both the “do not know” and “no” groups were more worried about the possible long-term negative side effects of COVID-19 vaccines as opposed to people who already received a COVID-19 vaccine or intended to do so. In terms of perceived norms, the “yes” group indicated that most people like them will get a COVID-19 vaccination ($M = 6.20$; $SD = 1.02$) and that most people who are important to them, want them to get a COVID-19 vaccination ($M = 5.95$; $SD = 1.43$). Moreover, contrary to the “yes” group, both the “no” and “do not know” groups did not agree that getting a COVID-19 vaccine is their moral duty (see Table 6.3).

We compared the results of the returning to campus questions with the results of the vaccination questions to inspect whether vaccination was also a factor in people’s beliefs about returning to work safely in September and found no relation between those; the vaccination percentages were uniformly high among all three returning to campus groups.

Discussion

Reopening universities safely in times of COVID-19 is a complex process and requires not only infrastructure changes but also consideration of stakeholders’ perspectives during the decision-making process. The findings of this study point towards not only focusing on real risks but also on “psychological” feelings of risk of university personnel. In this study, we explored university personnel’s views and worries pertaining to returning to campus in the new academic year (Fall 2021) and their thoughts on COVID-19 vaccination. Although more than half of employees indicated that the university is a safe place to work in September, the findings of this study revealed that a substantial number of personnel considered the university building unsafe or were uncertain about how safe it would be to start again. We also found that 95% of personnel that participated in the survey were vaccinated or were going to get vaccinated. To our knowledge, there are no comparable studies published yet in this (or similar) setting and/or context.

Although more than half of personnel indicated that starting to work full-on on campus in the new academic year is neither too soon nor unsafe, a large minority of personnel stated that they have to protect themselves against others while working on campus; which was in line with their worries about getting infected by SARS-CoV-2,

despite the fact that COVID-19 vaccines were available and accessible to university staff and students at the time. Moreover, in addition to the infrastructure and COVID-19 regulations within the university, the main worries of personnel concerned meeting in large groups, exposure to students and staff who are returning from high-risk countries, and how to deal with vaccine deniers/refusers. They stated that they require clear guidelines from the university about how to deal with students who have health complaints.

In the Netherlands, all university personnel and students can get vaccinated against COVID-19. In this study, we found that most university personnel were either already vaccinated or intended to get vaccinated (94.7%). In our earlier study of university students (Chapter 4), 80% of students indicated they would be willing to get the COVID-19 vaccine. Even though vaccination uptake did not show to be the major concern in this study, the UM board can still facilitate informed decision making around COVID-19 vaccination by targeting beliefs underlying vaccine hesitancy (e.g., side effects, the safety of the vaccines; see, for instance Malik et al., 2020; Paul et al., 2021; Chapter 4). Moreover, due to the fact that people who are vaccinated can still be infected and spread the virus to others, it is advisable to implement COVID-19 regulations such as distancing, face coverings, testing, and isolating when offering on-site education as university personnel also viewed these measures as necessary (although only about half of the personnel viewed face masks necessary). Abandoning all COVID-19 regulations within the university when offering in-person education might increase the risk of infection at this stage of the pandemic when not all, or most, students are fully vaccinated in September 2021 as evidence shows that the highest effectiveness of the vaccines against the Delta variant (relevant for two-dose vaccines) is reached weeks after the uptake of two doses (Lopez Bernal et al., 2021). Furthermore, this might create anxiety among personnel and students who do not feel safe and are worried about being infected by SARS-CoV-2. Therefore, a stage-wise relaxation in the measures depending on the pandemic severity seemed advisable in educational institutions at that time.

The COVID-19 pandemic has demonstrated the importance of behavior change in combating the pandemic and having behavior change expertise in the planning group while developing and implementing theory- and evidence-based interventions (Allegrante et al., 2020; Michie & West, 2021; Nejhadadgar et al., 2021; West et al., 2020). Behavior change requires an understanding of the reasons behind people's behavior and the psychological mechanisms through which behavior change can be reached by means of education and communication programs (Bartholomew Eldredge et al., 2016). Thus far, several studies were conducted to identify the determinants

of people's compliance with preventive measures (e.g., Chu et al., 2020; Clark et al., 2020; Hagger et al., 2020). The available empirical findings should be utilized with the guidance of behavior-change experts while planning the interventions (Ruiter & Crutzen, 2020). The findings of the current study can be used by universities to provide their personnel with clear communication and guidance with regard to COVID-19 regulations, what to do when having symptoms, and how to deal with students who have health complaints indicative of COVID-19.

The COVID-19 pandemic has also led to a change in the work culture. Most personnel started working from home either fully or partly for more than a year and created a work habit and environment that best suits them. During the COVID-19 pandemic, university personnel and students experienced high levels of psychological distress (Der Feltz-Cornelis et al., 2020). As found in our study, university personnel require a transition period when returning to on-site work to get accustomed to their old work environment and habits. As we found that personnel have worries about working on campus in times of COVID-19, a prompt switch to on-site work might exacerbate their anxiety. We, therefore, did suggest that the UM board consider allowing personnel to temporarily work from home when not feeling safe yet, giving them the opportunity to get accustomed to “the new normal”.

Summarizing the results on returning to campus: employees from Maastricht University were willing (“happy”) to start working again on campus and see their colleagues and students in September 2021. However, they also saw risks and dangers, expressed in various descriptions of unsafe and unpredictable encounters and settings. Therefore, our policy recommendation to the board of the university was: give personnel an opportunity to reacquaint themselves with working in close quarters—start with a transition period in September and allow them to acquire work-on-site experiences.

Translating the Findings into a Brief Intervention

Based on the findings of this study, the UM's marketing and communication department developed the following brief intervention for UM personnel and students to inform them about the measures and facilities that the university will provide to ensure a safe environment for the university's anticipated September opening. The intervention consisted of a Webinar, on 6 July 2021, in which the results were summarized and presented by one of the researchers: UM-employees see risks and dangers, expressed in various descriptions of unsafe and unpredictable encounters and settings. The data show two explanations: (1) factual/epidemiological/medical reasons: uncertainties

about the effect of vaccination in relation to new variants, and (2) psychological reasons: people have learned for more than a year to see others as a threat. That feeling cannot be switched off by a cognitive decision; people need some time to get accustomed again to social contacts. The policy recommendation was: if UM opens in September, give personnel a chance to reacquaint themselves to working close to others, i.e., start with a transition period during which people are not required to be present full time, but are instead encouraged to acquire work-on-site experiences in order to encourage them to return to work full time later. This was followed by a response from the Rector Magnificus of the university, explaining the measures that the university planned to take to provide a safe environment for personnel and students if the university could reopen after the summer break: [youtube.com/watch?v=6OHCM7xXV1Q](https://www.youtube.com/watch?v=6OHCM7xXV1Q). University personnel were also referred to the vaccination webpage of the university which involves a frequently asked question section, videos developed with the involvement of experts from Maastricht University (Chapter 5), and other informational resources on COVID-19 vaccines.

Immediately after the decision, on 13 August, by the Dutch Government that the universities were allowed to reopen in September 2021, personnel (and students) were informed about the measures taken via the university website and through email.

Based on the results of this study, personnel were told that if they had any concerns about safety despite all the precautions taken, they could contact their manager. Managers were provided with a guideline on how they can talk to personnel about these concerns and what they can do together so that people can return to work with peace of mind. If there are any medical reasons why personnel cannot come to work (or if they have symptoms like sniffing or coughing), they can make an appointment with the company doctor after having consulted their manager. Following up on the results of the “trust and worry” outcomes, a step-wise guide for (teaching) staff concerning how to deal with students who have symptoms was provided: step (1) teachers were advised to ask the student to leave the classroom and get tested; step (2) in case the teacher encounters a protest from the student, appropriate verbal responses to the student were provided with examples; and step (3) if the student still refuses to leave the building, the teacher was advised to contact the building manager who has the authority to order the student to leave.

In the end, there were some discrepancies between the advice of the researchers and the final decisions by the UM Board. This is not uncommon as governing bodies have to take into account other issues than safety as well. The advice of the researchers to the board was, when the situation was deemed to be safe, to reopen the university and give personnel who were hesitant some time to re-acclimate to work in a social

setting. The board decided to open up the university on September 1st, as mandated by the government (despite the negative advice of the Outbreak Management Team; the governmental advisory board of experts), and to delegate the final decision about hesitant personnel to the company doctor, implying that only medical reasons were acceptable. Moreover, the formal (national) regulation for personnel not directly involved in teaching was to work from home as much as possible, which was formalized at Maastricht University as: 3 days at the office and 2 days from home.

Limitations and Strengths of the Study

This study has several limitations. We developed the questionnaire based on theories, empirical findings, and a limited number of interviews with university personnel. Although we interviewed personnel with different characteristics (e.g., cross-border workers, parents, different age groups, etc.), we might have missed some other viewpoints and worries of university personnel about returning to campus in the new academic year. However, we included an open-ended question at the end of the survey asking for any further remarks. Most of those remarks were about the positive aspects of working from home; others were about medical reasons for not vaccinating and the problems connected to providing informal care for family members. Those last two issues were taken up by the occupational health department. Second, we are in an insecure period due to uncertainties around new variants and thus, as a result, changes in the mitigation rules, staff members' perspectives, and concerns may shift over time. Hence, university boards should monitor their personnel's views toward working on campus in the future and adjust their strategies and policies accordingly. Third, this study was conducted in the Netherlands. Although we believe that the findings of our study would assist university boards in other countries as well while developing policies in their educational institutions, the feelings of safety of university personnel and their worries might vary depending on the COVID-19 risk level of the country and the vaccination level. Therefore, we suggest that university boards in future cases involve their own stakeholders in these policy planning processes. Lastly, the personnel recruited via Flycatcher and via the university mail might have been different, although they had highly comparable outcomes. That was somewhat unexpected, as the panel is based on people's interest in university issues, while the response of all personnel might be based on interest in COVID-19, and it may indicate that the outcomes could be better generalizable than expected based on the response rates.

Conclusions

In times of COVID-19, more than half of university personnel found the university a safe place to return to in the new academic year. Still, some personnel feel unsafe for various reasons. University personnel found meeting in large groups unsettling and expressed concerns about becoming infected. In light of these worries, a prompt transition to on-site work could jeopardize their physical and psychological well-being as personnel have claimed that they require a transition period while returning to campus. These findings did assist the UM board in its decision-making process. This study demonstrates that doing research among personnel to develop adequate measures to promote employees' safety, and their feelings of safety, was useful for university boards and may be applied in comparable future situations.

References

- Adedoyin, O. B., & Soykan, E. (2020). Covid-19 pandemic and online learning: the challenges and opportunities. *Interactive Learning Environments*, 1–13. <https://doi.org/10.1080/10494820.2020.1813180>
- Ajzen, I. (2015). The theory of planned behaviour is alive and well, and not ready to retire: a commentary on Sniehotta, Pesseau, and Araújo-Soares. *Health Psychology Review*, 9(2), 131–137. <https://doi.org/10.1080/17437199.2014.883474>
- Allegrante, J. P., Auld, M. E., & Natarajan, S. (2020). Preventing COVID-19 and Its Sequela: “There is No Magic Bullet... It’s Just Behaviors”. *American Journal of Preventive Medicine*, 59(2), 288. <https://dx.doi.org/10.1016%2Fj.amepre.2020.05.004>
- Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology*, 52(1), 1–26. <https://doi.org/10.1146/annurev.psych.52.1.1>
- Bartholomew Eldredge, L. K., Markham, C. M., Ruitter, R. A. C., Fernández, M. E., Kok, G., & Parcel, G. S. (2016). *Planning health promotion programs: an Intervention Mapping approach*. John Wiley & Sons.
- Belansky, E. S., Cutforth, N., Chavez, R. A., Waters, E., & Bartlett-Horch, K. (2011). An adapted version of intervention mapping (AIM) is a tool for conducting community-based participatory research. *Health Promotion Practice*, 12(3), 440–455. <https://doi.org/10.1177%2F1524839909334620>
- Brammer, S., & Clark, T. (2020). COVID-19 and management education: Reflections on challenges, opportunities, and potential futures. *British Journal of Management*, 31(3), 453. <https://doi.org/10.1111/1467-8551.12425>
- Burns, D., Dagnall, N., & Holt, M. (2020). Assessing the impact of the COVID-19 pandemic on student wellbeing at universities in the United Kingdom: A conceptual analysis. *Frontiers in Education*, 5, 582882. <https://doi.org/10.3389/feduc.2020.582882>
- Byrd, T. L., Wilson, K. M., Smith, J. L., Heckert, A., Orians, C. E., Vernon, S. W., ... Fernandez, M. E. (2012). Using intervention mapping as a participatory strategy: development of a cervical cancer screening intervention for Hispanic women. *Health Education & Behavior*, 39(5), 603–611. <https://doi.org/10.1177%2F1090198111426452>
- Chu, D. K., Akl, E. A., Duda, S., Solo, K., Yaacoub, S., Schünemann, H. J., ... Reinap, M. (2020). Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. *The Lancet*, 395(10242), 1973–1987. [https://doi.org/10.1016/S0140-6736\(20\)31142-9](https://doi.org/10.1016/S0140-6736(20)31142-9)
- Clark, C., Davila, A., Regis, M., & Kraus, S. (2020). Predictors of COVID-19 voluntary compliance behaviors: An international investigation. *Global Transitions*, 2, 76–82.
- Daly, M., & Robinson, E. (2021). Willingness to Vaccinate Against COVID-19 in the US: Representative Longitudinal Evidence From April to October 2020. *American Journal of Preventive Medicine*. <https://doi.org/10.1016/j.amepre.2021.01.008>
- Delacre, M., Leys, C., Mora, Y. L., & Lakens, D. (2019). Taking parametric assumptions seriously: Arguments for the use of Welch’s F-test instead of the classical F-test in one-way ANOVA. *International Review of Social Psychology*, 32(1). <http://doi.org/10.5334/irsp.198>
- De Oliveira Araújo, F. J., de Lima, L. S. A., Cidade, P. I. M., Nobre, C. B., & Neto, M. L. R. (2020). Impact of Sars-Cov-2 and its reverberation in global higher education and mental health. *Psychiatry Research*, 288, 112977. <https://doi.org/10.1016/j.psychres.2020.112977>

- Der Feltz-Cornelis, V., Maria, C., Varley, D., Allgar, V. L., & De Beurs, E. (2020). Workplace Stress, Presenteeism, Absenteeism, and Resilience Amongst University Staff and Students in the COVID-19 Lockdown. *Frontiers in Psychiatry, 11*, 1284. <https://doi.org/10.3389/fpsy.2020.588803>
- Dror, A. A., Eisenbach, N., Taiber, S., Morozov, N. G., Mizrachi, M., Zigron, A., ... Sela, E. (2020). Vaccine hesitancy: the next challenge in the fight against COVID-19. *European Journal of Epidemiology, 35*(8), 775–779. <https://doi.org/10.1007/s10654-020-00671-y>
- Ebrahim, S. H., Ahmed, Q. A., Gozzer, E., Schlagenhauf, P., & Memish, Z. A. (2020). Covid-19 and community mitigation strategies in a pandemic. *BMJ, 2020*;368:m1066. <https://doi.org/10.1136/bmj.m1066>
- Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. New York: Psychology Press
- Fernandez, M. E., Ruiter, R. A., Markham, C. M., & Kok, G. (2019). Intervention mapping: theory- and evidence-based health promotion program planning: perspective and examples. *Frontiers in Public Health, 7*, 209. <https://doi.org/10.3389/fpubh.2019.00209>
- Hagger, M. S., Smith, S. R., Keech, J. J., Moyers, S. A., & Hamilton, K. (2020). Predicting social distancing intention and behavior during the COVID-19 pandemic: An integrated social cognition model. *Annals of Behavioral Medicine, 54*(10), 713–727. <https://doi.org/10.1093/abm/kaa073>
- Lopez Bernal, J., Andrews, N., Gower, C., Gallagher, E., Simmons, R., Thelwall, S., ... Ramsay, M. (2021). Effectiveness of Covid-19 vaccines against the B. 1.617. 2 (Delta) variant. *New England Journal of Medicine, 385*(7), 585–594. <https://doi.org/10.1056/NEJMoa2108891>
- Maddux, J. E., & Rogers, R. W. (1983). Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. *Journal of Experimental Social Psychology, 19*(5), 469–479. [https://doi.org/10.1016/0022-1031\(83\)90023-9](https://doi.org/10.1016/0022-1031(83)90023-9)
- Malik, A. A., McFadden, S. M., Elharake, J., & Omer, S. B. (2020). Determinants of COVID-19 vaccine acceptance in the US. *EClinicalMedicine, 26*, 100495. <https://doi.org/10.1016/j.eclinm.2020.100495>
- Michie, S., & West, R. (2021). Sustained behavior change is key to preventing and tackling future pandemics. *Nature Medicine, 27*(5), 749–752. <https://doi.org/10.1038/s41591-021-01345-2>
- National Institute for Public Health and the Environment (2021). *Current information about COVID-19. Archive COVID-19 weekly figures*. Ministry of Health, Welfare and Sport, National Institute for Public Health and the Environment. <https://www.rivm.nl/en/coronavirus-covid-19/current-information>
- Nejhaddadgar, N., Azadi, H., Mehedi, N., Toghroli, R., & Faraji, A. (2021). Teaching adults how to prevent COVID-19 infection by health workers: The application of intervention mapping approach. *Journal of Education and Health Promotion, 10*. https://doi.org/10.4103/jehp.jehp_1398_20
- Neumann-Böhme, S., Varghese, N. E., Sabat, I., Barros, P. P., Brouwer, W., van Exel, J., ... Stargardt, T. (2020). Once we have it, will we use it? A European survey on willingness to be vaccinated against COVID-19. *The European Journal of Health Economics, 21*(7), 977–982. <https://doi.org/10.1007/s10198-020-01208-6>
- Paul, E., Steptoe, A., & Fancourt, D. (2021). Attitudes towards vaccines and intention to vaccinate against COVID-19: Implications for public health communications. *The Lancet Regional Health-Europe, 1*, 100012. <https://doi.org/10.1016/j.lanepe.2020.100012>

- Quinn, S. C., Jamison, A. M., An, J., Hancock, G. R., & Freimuth, V. S. (2019). Measuring vaccine hesitancy, confidence, trust and flu vaccine uptake: Results of a national survey of White and African American adults. *Vaccine*, 37(9), 1168–1173. <https://doi.org/10.1016/j.vaccine.2019.01.033>
- Ruiter, R. A., Kessels, L. T., Peters, G. J. Y., & Kok, G. (2014). Sixty years of fear appeal research: Current state of the evidence. *International Journal of Psychology*, 49(2), 63–70. <https://doi.org/10.1002/ijop.12042>
- Ruiter, R. A., & Crutzen, R. (2020). Core processes: how to use evidence, theories, and research in planning behavior change interventions. *Frontiers in Public Health*, 8, 247. <https://doi.org/10.3389/fpubh.2020.00247>
- Sahu, P. (2020). Closure of universities due to coronavirus disease 2019 (COVID-19): impact on education and mental health of students and academic staff. *Cureus*, 12(4). <https://doi.org/10.7759/cureus.7541>
- Séveno, V. (2021, May). *De Jonge: Everyone in the Netherlands can be fully vaccinated by September*. IamExpat. Available online: <https://www.iamexpat.nl/expat-info/dutch-Expat-news/De-Jonge-Everyone-Netherlands-Can-Be-Fully-Vaccinated-September>
- Taylor, S., Landry, C. A., Paluszek, M. M., Groenewoud, R., Rachor, G. S., & Asmundson, G. J. (2020). A proactive approach for managing COVID-19: the importance of understanding the motivational roots of vaccination hesitancy for SARS-CoV2. *Frontiers in Psychology*, 11, 2890. <https://doi.org/10.3389/fpsyg.2020.575950>
- Von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Götzsche, P. C., & Vandenbroucke, J. P. (2007). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Bulletin of the World Health Organization*, 85, 867–872.
- West, R., Michie, S., Rubin, G. J., & Amlôt, R. (2020). Applying principles of behaviour change to reduce SARS-CoV-2 transmission. *Nature Human Behaviour*, 4(5), 451–459. <https://doi.org/10.1038/s41562-020-0887-9>

Chapter 7

General Discussion

During the academic year 2020–2021, many actions were taken to combat the COVID-19 pandemic at Maastricht University (UM). Our project team involved several experts from different disciplines. The aim of this dissertation was to optimize the safety of Maastricht University students and employees by supporting the decisions made by the University Board in tackling the COVID-19 pandemic by means of providing theory- and evidence-based information and interventions.

The content of the chapters evolved following the trajectory of the COVID-19 pandemic. The first part of this dissertation (**Chapters 2 and 3**) focused on COVID-19 preventive regulations of the university and how to increase students' adherence to these regulations. The second part (**Chapters 4 and 5**) concentrated on students' COVID-19 vaccination intention and how to support them in their vaccination decisions. The third part (**Chapter 6**) was on the safety feelings of employees when returning to campus in the new academic year and how to increase their feelings of safety. The results of the studies informed the development of theory- and evidence-based interventions. This final chapter, the general discussion, provides an overview of the main findings, discusses the methodological and practical considerations, and proposes agenda items for future research.

Overview of Main Findings

A. Students' Adherence to COVID-19 Regulations of the University

From September 2020 until December 2020, Maastricht University students were allowed to come to the university. However, due to the sharp increase in the number of COVID-19 cases and hospitalizations, education was moved to be fully online in January 2021. For the period of September–December 2020, we aimed to 1) understand the extent to which students adhere to COVID-19 guidelines of the university and the barriers and facilitators of their (non)adherence (**Chapter 2**), and 2) select the most relevant determinants of students' adherence to guidelines that should serve as targets for an intervention to increase adherence (**Chapter 3**). The findings from **Chapter 2** (Study 1) demonstrated that most students were willing to adhere to guidelines. They thought that the COVID-19 guidelines of the university and the established infrastructure help effectively deal with the infections. Students indicated that they found it difficult to keep distance in situations when there is not enough space to keep distance (e.g., check-in/out and stairs at the library), when others do not keep distance, when they meet with their friends, and when they simply forget to keep a 1.5 m distance and fall back into their old habits. Some students indicated that they feel

uncomfortable warning others to maintain a 1.5 m distance and would prefer someone more senior or with authority, such as tutors, lecturers, or stewards, do that. Other students reported they were not afraid of contracting the coronavirus because they are young. Nevertheless, even if they themselves were not afraid of COVID-19, they are concerned about potentially infecting others, particularly vulnerable individuals. Additionally, students mentioned that their adherence to guidelines was affected by their perception of the behavior of their friends, tutors, and teachers.

After gathering information on students' adherence to COVID-19 guidelines of the university, and its facilitators and barriers, the next step was to identify the most relevant determinants as the targets of the intervention to be developed. Therefore, in **Chapter 3** (Study 2), we conducted a cross-sectional survey and selected the most relevant determinants (and underlying beliefs) of students' adherence to guidelines, including keeping a 1.5 m distance, getting tested, and isolating, by simultaneously looking at two different types of statistical information concerning the contribution of the determinants to the explanation of adherence intentions (i.e., the strength of association and available room for improvement) (Crutzen et al., 2017). The findings of this study demonstrated that although students adhered to or were willing to adhere to guidelines, there was room for improvement in certain determinants and beliefs, such as attitude, perceived norm, self-efficacy, and several beliefs (e.g., risk perception belief "I am not afraid because I am young"; attitudinal beliefs, e.g., "I feel responsible for telling people to adhere to guidelines"; and self-efficacy beliefs, e.g., "COVID-19 prevention guidelines are difficult to adhere to"). Based on the findings of Studies 1 and 2, a brief intervention, a Christmas/New Year message, was developed. The relevant determinants and beliefs were targeted in the intervention by matching them with theory-based behavior change methods and translating these methods into practical applications (i.e., sentences within the message) while taking into account the parameters of effectiveness for each behavior change method. For instance, when translating the behavior change method of 'modeling', which was described as "providing an appropriate model being reinforced for the desired behavior" (Kok, 2014, p. 160), into a practical application, the parameters of effectiveness, such as "self-efficacy and skills, identification with the model, and coping model instead of a mastery model" (Kok, 2014, p. 160), need to be considered for the application to be effective.

Reflections

In our studies, we focused on adherence to general COVID-19 guidelines of the university, and specific guidelines, including distancing, avoiding crowds, testing and isolating when experiencing symptoms or coming into contact with an infected person.

Although wearing a face mask is an essential preventive measure against COVID-19, we did not examine students' adherence to this guideline because it was not mandatory in the Netherlands until mid-November 2020 and therefore was not implemented as a regulation within the university during our data collection period.

At the time of our studies, there was limited empirical evidence on students' adherence to COVID-19 preventive regulations. However, evidence has since accumulated. Our findings on the predictors of university students' adherence to COVID-19 regulations are in line with the empirical findings from other studies. For instance, in a study by Graupensperger et al. (2021), normative beliefs about peers' behaviors were found to influence college students' adherence to guidelines, and the support for norms-based interventions to increase adherence was discussed. Furthermore, risk perception was found to be an important predictor of adherence to preventive behaviors among college students and focusing on protecting vulnerable populations or loved ones in communications was suggested (Berg-Beckhoff et al., 2021; Kollmann et al., 2022). Our Christmas/New Year message intervention was in line with these recommendations on developing programs and communications to increase adherence to guidelines among university students. As an example, we used behavior change methods (d: scenario-based risk information; e: anticipated regret; f: punishment) to target risk perception and formulated messages: *"It is a well-established fact that young people can transmit COVID-19 without experiencing any symptoms themselves (d). So, even if you are young and think you are protected against the effects of COVID-19, you can still be a danger to others (d). Imagine how you would feel if someone else who is vulnerable were to become infected with COVID-19 because of you (e). This could happen while you are visiting your family during the Christmas holidays, as well as if you stay in Maastricht and fail to follow the safety protocols (f)."* (Chapter 3).

Wismans et al. (2020) collected data from ten countries on university students' adherence to COVID-19 preventive regulations and identified the relevant predictors of students' adherence. They found that adherence to preventive behaviors varied depending on the country of residence. This highlights the importance of considering the target population and their environment when developing interventions. Additionally, they found that attitudes and descriptive norms predict distancing and hygiene behaviors. Based on this finding, they argued that combining preventive behaviors into a single measure might be misleading when identifying predictors. Therefore, it is important to examine predictors for different behaviors separately. In our study, we did not investigate all relevant preventive behaviors due to the potential for increased dropout rates with longer surveys. We included measurement instruments for general COVID-19 guidelines and specific behaviors such as distancing, testing,

and isolating. These behaviors were chosen based on their significance for university students and the university context.

To gain a deeper understanding of a) the effective preventive behaviors, b) the factors that predict university students' adherence to COVID-19 guidelines, and c) the effectiveness of communication methods and programs in managing the pandemic, systematic reviews are needed. This research can provide valuable insights that can be used to develop better guidelines and strategies for dealing with future pandemics and other crises.

B. Students' Vaccination Intention and Its Determinants

In January 2021, the Dutch government initiated the rollout of COVID-19 vaccines. The government followed a staggered approach: starting with vaccinating vulnerable groups and health care professionals first and followed by age groups in descending order (older to youngsters). In this order, students became eligible to vaccinate in the summer of 2021. Hence, we decided to move our focus to students' vaccination intention and develop an intervention to help students make their vaccination decision. In **Chapter 4** (Study 3), we aimed to identify the reasons (determinants/beliefs) behind students' possible vaccination hesitancy and select the most relevant determinants/beliefs to address in our communication to further improve the COVID-19 vaccination uptake. The findings of this study revealed that 80% of students intended to get the COVID-19 vaccine when it was their turn. The concerns about the safety and side effects of the COVID-19 vaccine and trust in the government, quality control, and the pharmaceutical industry were the most relevant intervention targets to improve students' vaccination intention. Possible long-term side effects and safety of the COVID-19 vaccines were the main concerns among students. Other relevant determinants and/or beliefs that could be improved were attitudes, perceived norms, self-efficacy and perceived risks of the coronavirus infection. Based on the findings of this study, an intervention, a COVID-19 vaccination webpage on the university's website, was developed to target the relevant determinants/beliefs and, thus, COVID-19 vaccination intention. The vaccination webpage included a series of videos, interviews with experts from the university, and frequently asked questions. The interviews were produced with the involvement of the communication department of the university. In each interview, a student reporter directed questions to the experts. For the first part, two experts in clinical microbiology answered the questions on risk perception and worries and trust. For the second part, two experts in health promotion and health psychology answered questions about attitudes and perceived norms. The third part

was on self-efficacy and included online instructions on how, where, and when to get the vaccine. **Chapter 5** provided detailed information on the development protocol of the intervention.

Reflections

Systematic and scoping reviews have identified common factors that contribute to COVID-19 vaccination hesitancy, such as concerns about the side effects and safety of the vaccines, and a lower perceived risk of contracting the virus and its consequences (Aw et al., 2021; Biswas et al., 2021; Q. Wang et al., 2021). Similar findings have been reported in studies among university students, which were in line with our results (Belingeri et al., 2021; Neunhöffer et al., 2022; P. W. Wang et al., 2021; Shahwan et al., 2022).

Studies have shown that receiving information about COVID-19 vaccines from healthcare experts is associated with an increased likelihood of being vaccinated against COVID-19 (Mant et al., 2021; P. W. Wang et al., 2021; Tam et al., 2022). This suggests that providing trustworthy information from medical professionals can help address hesitancy and increase vaccination rates. In our online vaccination intervention, we also decided to include experts from the health faculty of the university in the videos with the thought of providing reliable information and building trust. By also including a student reporter who directed questions to the experts, we thought to create a sense of relatedness for the audience. Additionally, a study conducted by Tam et al. (2022) among university students in South Carolina found that the hesitant group valued advice from the university. Based on these findings, it was suggested that involving the university in communication strategies would be beneficial. These findings also support our decision to involve experts from the health and medical faculty in our vaccination intervention. By working closely with the university, we aimed to provide support to students in their vaccination decision rather than forcing them to get vaccinated.

C. Employees' Feelings of Safety When Returning to Campus

By the summer of 2021, all university personnel and students became eligible for COVID-19 vaccination. Societies started opening up with the increase in vaccination uptake. After more than a year of (mostly) online teaching and research, it was deemed possible to return to on-campus education in the new academic year (2021–2022). Hence, we moved our focus to the preparation for the new academic year and, in **Chapter 6** (Study 4), a study was conducted with UM employees on their safety feelings when returning to the campus in September 2021. Based on the findings of

this study, 94.7% of personnel were already vaccinated or willing to do so. More than half of the university personnel deemed the university a safe place to return to, and they indicated that they are happy to see their colleagues and students again. However, some personnel disclosed their concerns about returning to work in September for different reasons, such as meeting in large groups and becoming infected. Moreover, personnel indicated that they need a transition period to get accustomed to working on campus again. The findings of this study translated into a report for the University Board to support them in their decision for the new academic year. We recommended the board to allow personnel to reacquaint themselves with working in confined places, so start with a transition period in September and allow personnel to acquire on-site working experiences. Based on the findings of this study, UM Board implemented an intervention, an online webinar, where a researcher from the team communicated the findings, which was followed by a response from the Rector Magnificus on how the university plan to provide a safe environment for personnel and students if the university could reopen in September 2021.

Following the decision by the Dutch Government (August 13th) that the universities were allowed to return to on-site education in the new academic year (2021–2022), based on the findings of our study, among others, UM was taken the following measures for the on-site education and research: 1) If personnel had any safety concerns, they could contact their manager; 2) A guideline was provided to the managers on how to communicate with the university personnel about their concerns and what to do together so that personnel can return to work; 3) University personnel can make an appointment with the company doctor after having consulted their manager if there are any medical reasons why they cannot come to work (or if they have symptoms). Additionally, (teaching) staff were instructed on how to react to students who have symptoms: 1) asking the student to leave the classroom and get tested, 2) if the teacher encounters a protest from the student, guidelines on how to respond to the student were provided with examples, and 3) if the student continues refusing to leave the building, the teacher was advised to contact the building manager to order the student to leave. Moreover, the research staff were advised to work on-site part-time.

Reflections

The literature on safely returning to work illustrated the importance of tailoring policies specific to the type of work as well as according to the needs of individuals, such as people with disabilities, people with long COVID-19, and people who have high risk of experiencing severe COVID-19 consequences (Godeau et al., 2021; Shaw et al., 2020). The measures taken by the Maastricht University Board when returning to

on-site work were tailored towards the needs of the university employees and students and aimed to address the safety and health concerns of the employees. Our study provided input for these measures. Taylor et al. (2020) also stressed the importance of communication during a crisis. They advised managers to address the concerns of the employees by providing information on future policies and plans in a timely manner. In line with this advice, the online webinar intervention implemented by the University Board intended to address the concerns of the university employees and inform them about the measures for the upcoming academic year.

Gottlieb et al. (2020) provided a four-phase roadmap for reopening society in the US during the COVID-19 pandemic. Phase I included slowing the transmission of the virus through measures such as distancing, mask-wearing, the closure of schools and restaurants, and the promotion of remote work. Phase II focused on slowly reopening when hospitals were not under pressure and case numbers were decreasing. This phase included the implementation of interventions, such as testing and isolation, and the easing of certain measures, such as distancing. Phase III focused on returning to normal by lifting measures when vaccines were available and surveillance systems were in place. Phase IV centered on preparing for future pandemics.

At the time of our study with university employees, we were in the process of transitioning to Phase III of the reopening roadmap outlined by Gottlieb et al. (2020), which focused on returning to normal. Now, one year later, it appears that we have reached Phase IV, as measures such as mask-wearing, testing and isolation, and social distancing are no longer mandatory. Booster vaccines have been offered to increase immunity, and students and employees have returned to on-campus work and education without restrictions. While we have returned to a state of normalcy, it is clear that the COVID-19 pandemic has had lasting effects on education and work, including the acceleration of digitalization and the adoption of hybrid work and teaching as a practice (Amankwah-Amoah et al., 2021; Beck & Hensher, 2022; Guppy et al., 2022; Vargo et al., 2021). The lessons learned from the pandemic can inform Phase IV, future crisis preparedness (Gottlieb et al., 2020). In the following sections, we reflect on the methodological, practical, and future considerations for future crisis preparedness based on the lessons learned from our project.

Methodological, practical, and future considerations

The COVID-19 pandemic has demonstrated the need for large-scale behavior change, hence, the role of behavioral science (Bavel et al., 2020; Betsch, 2020; West et al., 2020).

Preventive measures including not only distancing, testing, isolation, and facemask use but also vaccination have been dependent on people's adherence to these measures (Volpp et al., 2021). Achieving high adherence to these measures was a way to combat the pandemic. However, changing behavior and maintaining this change are complex endeavors and require expertise in behavior change and planned behavior change interventions.

Planned behavior change consists of problem diagnosis, program production, implementation, and evaluation (Kok et al., 1996). In this part, the methodological, practical, and future considerations were discussed based on the lessons learned from our project, which was in the context of the COVID-19 pandemic, but these considerations may be valuable for future pandemics and crisis preparedness.

1. The COVID-19 disease is only one piece of the whole puzzle, and an interdisciplinary approach is required to combat it.

The COVID-19 pandemic has had far-reaching impacts on various aspects of society, including health, the economy, and education. Hence, it required a collaborative act of different disciplines (Moradian et al. 2021; Wen et al., 2021) and helped us acknowledge how misinformation, behavior change, vaccine hesitancy, health inequalities, infectious diseases, and so on are connected, and working on each of these areas contributes to one goal – combating the COVID-19 pandemic. Przybylko et al. (2021) also highlighted the need for using an interdisciplinary approach to develop and increase the effectiveness of mental health interventions. Collaboration among different disciplines to tackle a crisis also concerns the development of behavior change interventions. In our project, experts from different disciplines worked towards finding solutions to a mutual goal – increasing the safety of Maastricht University students and employees in times of COVID-19. The core group included experts specialized in health and social psychology, health promotion, behavior change, and epidemiology. In the different stages of the project, experts with specializations in microbiology and communication got involved.

2. Planning behavior change interventions takes time. However, in times of crisis, speeding up the planning process is needed to provide a timely response.

In the past two years, we have learned that rapid behavior change is possible but requires timely interventions to facilitate and sustain behavior change. Yet, developing an intervention might be time-consuming as it requires a systematic approach. *Intervention Mapping* is a framework to plan the development of theory-and evidence-

based behavior change interventions (Fernandez et al. 2019a). Although Intervention Mapping was evaluated as the most elaborate approach to developing interventions in a systematic methods overview (O’Cathain et al. 2019), it also has been criticized multiple times as time-consuming (McEachan et al., 2008; Munir et al., 2013; Wight et al., 2016). For our project, we used the Intervention Mapping framework to guide our intervention planning process and combat a novel problem – the COVID-19 pandemic. We had to act fast as we were providing support to the University Board in dealing with a global health crisis within a university setting. To accelerate the time taken between the translation of research to interventions, first we need to identify the reasons that slow down the process. Based on the review of the policy documents, Hanney et al. (2015) illustrated some of these reasons, such as bureaucratic obligations and recruitment. They also provided approaches to reduce the time taken between the research and policies and interventions, such as working in parallel and increasing resources (Hanney et al., 2015, 2020). In **Chapter 5**, we reflected on speeding up the intervention development process for our vaccination intervention. In this section, we reflect on our project entirely. In addition to working in parallel and using frameworks that systematize the process, the reflections below on how we speeded up the process may also serve as input for future crises preparedness:

- **Target Population**

The target population of our project was Maastricht University students and employees. To collect data and gather input from our target population, we used the university’s already existing survey panels and communication channels. In the second half of 2021, data was collected from the Turkish population living in the Netherlands on their vaccination intention as well as their reasons to vaccinate or not vaccinate for another project. Reaching out to the Turkish population took months with limited success as it required identifying the key stakeholders who had access to the target population, getting in touch with these stakeholders, arranging the meetings with the target population in consultation with the stakeholders, and so on. However, in times of crisis, time is limited. *Identifying and strengthening the networks that have quick access to the target population might speed up intervention development.*

- **Stakeholders**

Stakeholders is an umbrella term for people who have an active role in different parts of the intervention development and implementation. As they are getting involved in shared decision-making, which has an impact on the end product, the identification and involvement of the stakeholders from the start of the project was deemed

important. This also ensures that stakeholders have a full picture of the project and are well-informed about the decisions made from the beginning. Hoover et al. (2020) argued the importance of stakeholder engagement in an effective COVID-19 pandemic response. In addition to the identification and involvement of stakeholders, developing a mutual trust relationship with the stakeholders by, for instance, trusting the expertise of producers, is important. For our project, for instance, we had the full support of the University Board from the beginning, which helped us to speed up the implementation as negotiation time was shortened. Moreover, during the interactions with the communication department, the mutual trust in the expertise of each other's sped up the program production. *Identifying and involving stakeholders from the beginning and building a mutual trust relationship with stakeholders might speed up the intervention development.*

- ***Existing Resources***

When the time and cost of the project are limited, it is valuable to identify and utilize the assets in the environment. Despite its value, asset assessment, part of Intervention Mapping Step 1, can easily be overlooked. It involves the identification of the assets of the population and their environment, which can be incorporated into the planning and implementation of the intervention. In our case, we had the support of the University Board, which allowed us to use the existing resources of the university that were relevant to our intervention. For our first intervention, the Christmas/New Year message for a safe break, we used our universities' newsletter as a communication channel to implement our intervention. A video that was developed by the university was integrated into our intervention as it was supporting our intervention by demonstrating the experiences of students who contracted COVID-19. For our second intervention, the vaccination webpage, instead of building a new website specific to our intervention, which would be more time-consuming and costly, we used the special COVID-19 website of the university as the delivery channel. This choice helped us to save time and money, but at the same time, it was more convenient for students to find all the relevant information on one website. For our third intervention, the webinar on safely returning to university in the academic year (2021 – 2022), the university's YouTube channel was used to reach out to the target population. *Conducting an asset assessment and identifying the existing resources at the beginning of the project could benefit to speed up the intervention development and implementation.*

Future Considerations

- ***Stakeholder Involvement***

Involving stakeholders in the development and implementation of behavior change interventions can enhance their impact and effectiveness. However, the identification of the appropriate stakeholders may remain a challenge and require a more systematic approach (Byrne, 2019). In this case, the socio-ecological model, the Core Processes, and the Intervention Mapping framework may provide guidance. The socio-ecological model postulates that to understand the factors influencing an individual's behavior (individual level), we need to inspect different levels (i.e., interpersonal, organizational, community, and organizational) and agents and environmental conditions at each level (Kilanowski, 2017). Hence, the socio-ecological model may guide in identifying the key stakeholders from each level, as also suggested by Hoover et al. (2020). In the case of identification of the relevant stakeholders, Core Processes may provide information supported by expert knowledge, empirical findings, theories, and research (Ruiter & Crutzen, 2020). Intervention Mapping by Bartholomew Eldredge et al. (2016) is a planning framework for behavior change interventions and assists in systematically planning the development of the intervention, implementation, and evaluation, which also provides guidance on who needs to be involved in the program development, implementation, and evaluation. Additionally, the Stakeholder Theory provides information on how to conduct a stakeholder analysis and promote change at organizations and involves four steps: 1) identification of stakeholders and their involvement; 2) stakeholder mapping and visualization in the network; 3) identifying stakeholder salience based on power, urgency, and legitimacy; and 4) selecting methods and pathways for change (Kok et al., 2015).

- ***Just-In-Time Adaptive Interventions***

Acting fast in times of crisis to address the problem is essential. Hence, researchers should put special emphasis on just-in-time adaptive interventions, the identification of the key features that facilitate the speedy development of interventions, and how to speed up the intervention development process without losing rigor. A Just-in-time adaptive intervention (JITAI) is an intervention design that generally uses e-/mHealth technologies. It monitors a person's internal state and the context in real-time and facilitates tailored interventions (Nahum-Shani et al., 2018). As the COVID-19 pandemic showed that people's behaviors are dependent on the context and may change over time, JITAIs might be helpful to monitor and meet this change by delivering tailored interventions. However, JITAIs also have limitations. A systematic review by Hardeman et

al. (2019) on just-in-time interventions aimed at promoting physical activity discusses the lack of theory use in intervention development and the lack of evidence on their cost-effectiveness and impact on health inequalities. Future studies could focus on an attempt to combine the key features of JITAIs and perspectives (e.g., participatory approach and socio-ecological model) and steps of the Intervention Mapping for the preparedness for future pandemics and crises.

- *Adaptation*

Although many effective interventions are available for use, the adaptation of existing interventions is undervalued. Evans et al. (2019) direct attention to the adaptability of interventions – if adaptation has more harm than its benefits, and the need for a framework to systematically adapt the interventions. Chapter 10 of “Planning health promotion programs: An Intervention Mapping approach” book by Bartholomew Eldredge et al. (2016) provides guidance on how to use the Intervention Mapping approach to adapt evidence-based interventions: 1) conducting a needs assessment to identify the health/behavior problems and developing logic models for the problem and change; 2) searching for evidence-based interventions in addressing similar issues; 3) evaluating fit and planning adaptation, 4) making adaptations by modifying materials and activities; 5) planning for the implementation of the intervention; and 6) developing a plan for evaluating the effectiveness of the intervention. Adaptations of interventions may accelerate the timely response and reduce the costs in times of crisis.

3. The use of Core Processes ensures the systematic approach to finding answers to the questions in the development of an intervention by consulting expert knowledge, empirical findings, and theories and conducting new research if needed.

Core Processes are a tool to assist the development of behavior-change interventions by providing information via the use of expert knowledge, empirical findings and theories, and data collection (Ruiter & Crutzen, 2020). The use of evidence and theory in the development of behavior-change interventions is well-established and considered to lead to effective interventions (Bartholomew & Mullen, 2011; Brug et al., 2005; Glanz & Bishop, 2010; Lippke & Ziegelmann, 2008; Penseau et al., 2022). Glanz and Bishop (2010) classify the theories as explanatory and change theories. Brug et al. (2005) argue that using theory is one thing and correctly using it is another. Core Processes can be used in different stages of intervention development and provide guidance on selecting theories for problem analysis, determinants, change methods, and implementation (Ruiter & Crutzen, 2020). One of the strengths of our project was that all

the interventions developed were informed by expert knowledge, empirical evidence, and theories. As the addressed problem, the COVID-19 pandemic was novel, the evidence was limited. Hence, we also gathered information from similar and relevant behaviors. In our studies and interventions, we used multiple theories, such as the Protection Motivation Theory (Maddux & Rogers, 1983) and the Theory of Planned Behavior (Ajzen, 1991), and theoretically informed behavior-change methods, such as modeling which was informed by Social Cognitive Theory and Theories of Learning (for details see Kok et al., 2016). However, there might be other theories relevant to the topics of our project. Conducting systematic reviews of the theories used in this area of research can provide valuable insights and inform future studies.

Future Considerations

- *Core Processes Template*

The development of a Core Processes template could provide 1) guidance to the researchers in the use of empirical findings and theories in finding answers to the questions in different stages of intervention development and/ or in general planning their research, and 2) provide input for future global crises by assisting the systematic documentation of answers.

4. Behaviors as well as their determinants may change over time. Monitoring the possible changes is needed.

To identify and select the targets of our interventions, we followed the traditional mixed-method approach (Bartholomew Eldredge et al., 2016; Peters, 2014): starting with a qualitative study (e.g., focus groups and interviews) and proceeding with a quantitative study (e.g., the cross-sectional surveys). Therefore, we only had data from specific time points. Nevertheless, the COVID-19 pandemic showed that people's behaviors as well as their determinants are open to change over time (Wright & Fancourt, 2021). One of the limitations of our project was that we based our decisions on the data of a specific time point. Hence, our interventions were not adapted to the possible changes in people's behavior and their determinants. However, within the constraints of time and money, it is a challenge to meet this change. Moreover, to select the relevant determinants and beliefs for our interventions, we used the Confidence Interval-Based Estimation of Relevance (CIBER) approach, which is the visualization of confidence intervals for the means and correlation coefficients (Crutzen et al., 2017; Fernandez et al. 2019a). As intervention developers, we have to make decisions on which determinants to include in the intervention. Hence, the visualization of these

two types of information helps researchers make judgments on the relevance of determinants based on the room for improvement (i.e., mean scores) and the association between determinants and intention/behavior. However, in order to monitor the behavior and its determinants, longitudinal studies are needed.

Future Considerations

- *Determinant Selection*

Although the CIBER approach (and CIBER plots) is a helpful tool for intervention developers to select the relevant determinants/beliefs as targets of their interventions when there are so many determinants/beliefs, it becomes a challenge to make this judgment. For instance, if there are 100 beliefs, making judgments on which beliefs to select as relevant targets for the intervention based on the visualizations of mean scores and associations is challenging as one needs to process and compare that much information manually. Moreover, this also makes the selection process more subjective (i.e., judgments of one person might differ from another, leading to a different list of selected relevant determinants/beliefs). The Potential for Change (P Δ) Index was developed by Knittle et al. (2019), which is the numerical representation of some important features of the CIBER approach. Although there is no available literature on the effectiveness of its use, the developers argue that the use of this metric may lead to more tailored interventions. In a COVID-19 project, Potential for Change Index 1 (P Δ 1) and Potential for Change Index 2 (P Δ 2) were used to select the relevant determinants. P Δ 2 involves using the 5% trimmed maximum and minimum, which helps to reduce sensitivity to outliers (Peters et al., 2021). Additionally, a paper on determinants of positive coach-bystander behavior combines the CIBER plots and the Potential for Change Index for the data analysis (Verhelle et al., 2022). The combination of the CIBER plots and the Potential for Change Index in one place may ease and strengthen the selection procedure when dealing with loads of determinants/beliefs.

5. Implementation might be more urgent than evaluation in times of crisis.

The evaluation of interventions can be considered a golden criterion to understand if the intervention achieved the desired effect or was implemented as planned. The implementation and evaluation of the interventions were anticipated from the beginning (Fernandez et al., 2019b). For our project, the implementation was prompt and relatively easy as we had the support of the University. However, we did not execute the evaluation for several reasons: 1) due to the everchanging conditions, such as moving from hybrid to fully online education in December 2020 due to the new lockdown, and 2)

as a proper evaluation requires having both intervention and control groups, in the context of COVID-19 vaccination, which was a voluntary act, ethical concerns arose. The lack of evaluation was a limitation of our project, as we could not know whether we achieved the aimed effect.

6. Adoption of Open science principles saves lives.

Without the availability of the data on the SARS-CoV-2 genome, it would have been impossible to develop COVID-19 vaccines at such a speed. Rios et al. (2020) discuss how open data sharing helped combat the COVID-19 pandemic. Open Science (OS) is an umbrella term for several OS principles, such as reproducibility, replicability, transparency, open access, and FAIR data sharing (Vicente-Saez & Martinez-Fuentes, 2018). Our project took place during the COVID-19 pandemic when having immediate access to the available literature had enormous importance among researchers to accumulate evidence-based knowledge to tackle the pandemic. Hence, we made sure to share the study materials, including the data (if ethically possible), analysis scripts, and interview guides, on an online repository with the wide public to help facilitate knowledge accumulation.

Future Considerations

- *Using Behavioral Science to Increase the Adoption of Open Science Principles*

Although the scientific institutes in the Netherlands embrace Open Science and encourage scientists to adopt the principles for their work, it depends on individual behavior. The insight from behavioral science could be used to foster the use of Open Science principles. There are already some examples of behavior change interventions developed, such as an evidence-based intervention to increase pre-registration (Osborne & Norris, 2022). Moreover, a recent article by Norris et al. (2022) identified five prioritized research questions in Health Psychology. These priorities concern 1) practice of Open Science behaviors in Health Psychology; 2) the usefulness of Open Data and Open Code resources; 3) maximizing Open Data within Health Psychology; 4) effective interventions to increase the adoption of Open Science in Health Psychology; and 5) maximizing free Open Access publishing in Health Psychology. Adherence to the FAIR (Findable, Accessible, Interoperable, Reusable) principles might facilitate useful data, code, and study materials sharing. However, this remains challenging for several reasons, such as working with qualitative data. Future work could focus on these five priorities and optimizing FAIR sharing.

Conclusion

This dissertation provided information on a project aimed at supporting the University Board when creating a safe environment within the university in times of the COVID-19 pandemic. Moreover, this dissertation reflected on the lessons learned from our project and provided some future considerations for future pandemic/crises preparedness: 1) forming a project group with experts from disciplines relevant to the problem; 2) identifying and strengthening the networks to reach out the target group; 3) identifying key stakeholders; 4) involving the target group and relevant stakeholders from the beginning of the project to gather their input and inform the intervention accordingly; 5) building a trust relationship with the stakeholders; 6) identifying and using existing resources; 7) following an intervention development framework to systematically develop interventions; 8) using empirical evidence and theories; 9) gathering information from similar problems if there is no or limited literature on the problem; 10) in case of need and changing situations, the implementation might be more important than evaluation; 11) investing time and money on frameworks for the development, implementation, and evaluation of just-in-time interventions; and 12) sharing data and findings with scientists and stakeholders.

References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211.
- Amankwah-Amoah, J., Khan, Z., Wood, G., & Knight, G. (2021). COVID-19 and digitalization: The great acceleration. *Journal of Business Research*, 136, 602–611. <https://doi.org/10.1016/j.jbusres.2021.08.011>
- Aw, J., Seng, J. J. B., Seah, S. S. Y., & Low, L. L. (2021). COVID-19 vaccine hesitancy—A scoping review of literature in high-income countries. *Vaccines*, 9(8), 900. <https://doi.org/10.3390/vaccines9080900>
- Bartholomew Eldredge, L. K., Markham, C. M., Ruiters, R. A. C., Fernández, M. E., Kok, G., & Parcel, G. S. (2016). *Planning health promotion programs: An Intervention Mapping approach*. John Wiley & Sons.
- Bartholomew, L. K., & Mullen, P. D. (2011). Five roles for using theory and evidence in the design and testing of behavior change interventions. *Journal of Public Health Dentistry*, 71, S20–S33. <https://doi.org/10.1111/j.1752-7325.2011.00223.x>
- Bavel, J. J. V., Baicker, K., Boggio, P. S., Capraro, V., Cichocka, A., Cikara, M., Crockett, M. J., Crum, A. J., Douglas, K. M., Druckman, J. N., Drury, J., Dube, O., Ellemers, N., Finkel, E. J., Fowler, J. H., Gelfand, M., Han, S., Haslam, S. A., Jetten, J., ... Willer, R. (2020). Using social and behavioural science to support COVID-19 pandemic response. *Nature Human Behaviour*, 4(5), 460–471. <https://doi.org/10.1038/s41562-020-0884-z>
- Beck, M. J., & Hensher, D. A. (2022). Australia 6 months after COVID-19 restrictions part 2: The impact of working from home. *Transport Policy*, 128, 274–285. <https://doi.org/10.1016/j.tranpol.2021.06.005>
- Belingheri, M., Ausili, D., Paladino, M. E., Luciani, M., Di Mauro, S., & Riva, M. A. (2021). Attitudes towards COVID-19 vaccine and reasons for adherence or not among nursing students. *Journal of Professional Nursing*, 37(5), 923–927. <https://doi.org/10.1016/j.profnurs.2021.07.015>
- Berg-Beckhoff, G., Dalggaard Guldager, J., Tanggaard Andersen, P., Stock, C., & Smith Jervelund, S. (2021). What predicts adherence to governmental COVID-19 measures among Danish students?. *International Journal of Environmental Research and Public Health*, 18(4), 1822. <https://doi.org/10.3390/ijerph18041822>
- Betsch, C. (2020). How behavioural science data helps mitigate the COVID-19 crisis. *Nature Human Behaviour*, 4(5), Article 5. <https://doi.org/10.1038/s41562-020-0866-1>
- Biswas, M. R., Alzubaidi, M. S., Shah, U., Abd-Alrazaq, A. A., & Shah, Z. (2021). A scoping review to find out worldwide COVID-19 vaccine hesitancy and its underlying determinants. *Vaccines*, 9(11), 1243. <https://doi.org/10.3390/vaccines9111243>
- Brug, J., Oenema, A., & Ferreira, I. (2005). Theory, evidence and Intervention Mapping to improve behavior nutrition and physical activity interventions. *International Journal of Behavioral Nutrition and Physical Activity*, 2(1), 1–7. <https://doi.org/10.1186/1479-5868-2-2>
- Byrne, M. (2019). Increasing the impact of behavior change intervention research: Is there a role for stakeholder engagement?. *Health Psychology*, 38(4), 290. <https://psycnet.apa.org/doi/10.1037/hea0000723>
- Crutzen, R., Peters, G. J. Y., & Noijen, J. (2017). Using confidence interval-based estimation of relevance to select social-cognitive determinants for behavior change interventions. *Frontiers in Public Health*, 5, 165. <https://doi.org/10.3389/fpubh.2017.00165>

- Evans, R. E., Craig, P., Hoddinott, P., Littlecott, H., Moore, L., Murphy, S., ... Moore, G. (2019). When and how do 'effective' interventions need to be adapted and/or re-evaluated in new contexts? The need for guidance. *Journal of Epidemiology and Community Health*, 73(6), 481–482. <http://dx.doi.org/10.1136/jech-2018-210840>
- Fernandez, M. E., Ruiter, R. A. C., Markham, C. M., & Kok, G. (2019a). Intervention Mapping: Theory and Evidence-Based Health Promotion Program Planning: Perspective and Examples. *Frontiers in Public Health*, 7, 209. <https://doi.org/10.3389/fpubh.2019.00209>
- Fernandez, M. E., ten Hoor, G. A., van Lieshout, S., Rodriguez, S. A., Beidas, R. S., Parcel, G., Ruiter, R. A. C., Markham, C. M., & Kok, G. (2019b). Implementation Mapping: Using Intervention Mapping to Develop Implementation Strategies. *Frontiers in Public Health*, 7, 158. <https://www.frontiersin.org/articles/10.3389/fpubh.2019.00158>
- Glanz, K., & Bishop, D. B. (2010). The role of behavioral science theory in development and implementation of public health interventions. *Annual Review of Public Health*, 31(1), 399–418. <https://doi.org/10.1146/annurev.publhealth.012809.103604>
- Godeau, D., Petit, A., Richard, I., Roquelaure, Y., & Descatha, A. (2021). Return-to-work, disabilities and occupational health in the age of COVID-19. *Scandinavian Journal of Work, Environment & Health*, 47(5), 408. <https://doi.org/10.5271%2Fsjweh.3960>
- Gottlieb, S., Rivers, C., McClellan, M., Silvis, L., & Watson, C. (2020). National coronavirus response: a road map to reopening.
- Graupensperger, S., Lee, C. M., & Larimer, M. E. (2021). Young adults underestimate how well peers adhere to COVID-19 preventive behavioral guidelines. *The Journal of Primary Prevention*, 42(3), 309–318. <https://doi.org/10.1007/s10935-021-00633-4>
- Guppy, N., Verpoorten, D., Boud, D., Lin, L., Tai, J., & Bartolic, S. (2022). The post-COVID-19 future of digital learning in higher education: Views from educators, students, and other professionals in six countries. *British Journal of Educational Technology*. <https://doi.org/10.1111/bjet.13212>
- Hanney, S. R., Castle-Clarke, S., Grant, J., Guthrie, S., Henshall, C., Mestre-Ferrandiz, J., ... Wooding, S. (2015). How long does biomedical research take? Studying the time taken between biomedical and health research and its translation into products, policy, and practice. *Health Research Policy and Systems*, 13(1), 1–18. <https://doi.org/10.1186/1478-4505-13-1>
- Hanney, S. R., Wooding, S., Sussex, J., & Grant, J. (2020). From COVID-19 research to vaccine application: why might it take 17 months not 17 years and what are the wider lessons? *Health Research Policy and Systems*, 18(1), 1–10. <https://doi.org/10.1186/s12961-020-00571-3>
- Hardeman, W., Houghton, J., Lane, K., Jones, A., & Naughton, F. (2019). A systematic review of just-in-time adaptive interventions (JITAs) to promote physical activity. *International Journal of Behavioral Nutrition and Physical Activity*, 16(1), 1–21. <https://doi.org/10.1186/s12966-019-0792-7>
- Hoover, A. G., Heiger-Bernays, W., Ojha, S., & Pennell, K. G. (2020). Balancing incomplete COVID-19 evidence and local priorities: risk communication and stakeholder engagement strategies for school re-opening. *Reviews on Environmental Health*, 36(1), 27–37. <https://doi.org/10.1515/reveh-2020-0092>
- Kilanowski, J. F. (2017). Breadth of the socio-ecological model. *Journal of Agromedicine*, 22(4), 295–297. <https://doi.org/10.1080/1059924X.2017.1358971>
- Knittle, K., Peters, G. J., Heino, M., Tobias, R., & Hankonen, N. (2019). Potential for change (PΔ): New metrics for tailoring and predicting response to behavior change interventions. <https://doi.org/10.17605/OSF.IO/DV96P>

- Kollmann, J., Kocken, P. L., Syurina, E. V., & Hilverda, F. (2022). The role of risk perception and affective response in the COVID-19 preventive behaviours of young adults: a mixed methods study of university students in the Netherlands. *BMJ Open*, *12*(1), e056288. <http://dx.doi.org/10.1136/bmjopen-2021-056288>
- Kok, G. (2014). *A practical guide to effective behavior change: How to apply theory- and evidence-based behavior change methods in an intervention*. PsyArXiv. <https://doi.org/10.31234/osf.io/r78wh>
- Kok, G., Gottlieb, N. H., Peters, G.-J. Y., Mullen, P. D., Parcel, G. S., Ruiter, R. A. C., Fernández, M. E., Markham, C., & Bartholomew, L. K. (2016). A taxonomy of behaviour change methods: An Intervention Mapping approach. *Health Psychology Review*, *10*(3), 297–312. <https://doi.org/10.1080/17437199.2015.1077155>
- Kok, G., Gurabardhi, Z., Gottlieb, N. H., & Zijlstra, F. R. (2015). Influencing organizations to promote health: Applying stakeholder theory. *Health Education & Behavior*, *42*(1_suppl), 123S–132S. <https://doi.org/10.1177/1090198115571363>
- Kok, G., Schaalma, H., De Vries, H., Parcel, G., & Paulussen, T. (1996). Social Psychology and Health Education. *European Review of Social Psychology*, *7*(1), 241–282. <https://doi.org/10.1080/14792779643000038>
- Lippke, S., & Ziegelmann, J. P. (2008). Theory-based health behavior change: Developing, testing, and applying theories for evidence-based interventions. *Applied Psychology*, *57*(4), 698–716. <https://doi.org/10.1111/j.1464-0597.2008.00339.x>
- Maddux, J. E., & Rogers, R. W. (1983). Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. *Journal of Experimental Social Psychology*, *19*(5), 469–479.
- Mant, M., Aslemand, A., Prine, A., & Jaagumägi Holland, A. (2021). University students' perspectives, planned uptake, and hesitancy regarding the COVID-19 vaccine: A multi-methods study. *PLoS One*, *16*(8), e0255447. <https://doi.org/10.1371/journal.pone.0255447>
- McEachan, R. R., Lawton, R. J., Jackson, C., Conner, M., & Lunt, J. (2008). Evidence, theory and context: using intervention mapping to develop a worksite physical activity intervention. *BMC Public Health*, *8*(1), 1–12. <https://doi.org/10.1186/1471-2458-8-326>
- Moradian, N., Moallemian, M., Delavari, F., Sedikides, C., Camargo, C. A., Torres, P. J., ... Rezaei, N. (2021). Interdisciplinary approaches to COVID-19. In *Coronavirus Disease-COVID-19* (pp. 923–936). Springer, Cham.
- Munir, F., Kalawsky, K., Wallis, D. J., & Donaldson-Feilder, E. (2013). Using intervention mapping to develop a work-related guidance tool for those affected by cancer. *BMC Public Health*, *13*(1), 1–13. <https://doi.org/10.1186/1471-2458-13-6>
- Nahum-Shani, I., Smith, S. N., Spring, B. J., Collins, L. M., Witkiewitz, K., Tewari, A., & Murphy, S. A. (2018). Just-in-time adaptive interventions (JITAs) in mobile health: key components and design principles for ongoing health behavior support. *Annals of Behavioral Medicine*, *52*(6), 446–462.
- Neunhöffer, A. T., Gibilaro, J., Wagner, A., Soeder, J., Rebholz, B., Blumenstock, G., ... Rind, E. (2022). Factors Associated with the COVID-19 Vaccination Status of Higher Education Students: Results of an Online Cross-Sectional Survey at Six Universities in Southwestern Germany. *Vaccines*, *10*(9), 1433. <https://doi.org/10.3390/vaccines10091433>
- Norris, E., Toomey, E., Reynolds, J., Green, J., Noone, C., Grant, S., & Prescott, A. (2022). Establishing open science research priorities in health psychology: a research prioritisation Delphi exercise. *Psychology & Health*. <https://doi.org/10.1080/08870446.2022.2139830>.
- O’Cathain, A., Croot, L., Sworn, K., Duncan, E., Rousseau, N., Turner, K., ... Hoddinott, P. (2019). Taxonomy of approaches to developing interventions to improve health: a systematic methods overview. *Pilot and Feasibility Studies*, *5*(1), 1–27. <https://doi.org/10.1186/s40814-019-0425-6>

- Osborne, C., & Norris, E. (2022). Pre-registration as behaviour: developing an evidence-based intervention specification to increase pre-registration uptake by researchers using the Behaviour Change Wheel. *Cogent Psychology*, 9(1), 2066304. <https://doi.org/10.1080/23311908.2022.2066304>
- Peters, G.-J. (2014). *A practical guide to effective behavior change: How to identify what to change in the first place*. <https://doi.org/10.31234/osf.io/hy7mj>
- Peters, G. J., Kwasnicka, D., Crutzen, R., ten Hoor, G., Varol, T., Berry, E., ... Roozen, S. (2021). *The your Covid-19 risk assessment tool and the accompanying open access data and materials repositories*.
- Presseau, J., Byrne-Davis, L. M., Hotham, S., Lorencatto, F., Potthoff, S., Atkinson, L., ... Byrne, M. (2022). Enhancing the translation of health behaviour change research into practice: a selective conceptual review of the synergy between implementation science and health psychology. *Health Psychology Review*, 16(1), 22–49. <https://doi.org/10.1080/17437199.2020.1866638>
- Przybylko, G., Morton, D. P., & Renfrew, M. E. (2021). Addressing the COVID-19 mental health crisis: a perspective on using interdisciplinary universal interventions. *Frontiers in Psychology*, 12, 644337. <https://doi.org/10.3389/fpsyg.2021.644337>
- Rios, R. S., Zheng, K. I., & Zheng, M. H. (2020). Data sharing during COVID-19 pandemic: what to take away. *Expert Review of Gastroenterology & Hepatology*, 14(12), 1125–1130. <https://doi.org/10.1080/17474124.2020.1815533>
- Ruiter, R. A. C., & Crutzen, R. (2020). Core Processes: How to Use Evidence, Theories, and Research in Planning Behavior Change Interventions. *Frontiers in Public Health*, 8. <https://doi.org/10.3389/fpubh.2020.00247>
- Shahwan, M., Suliman, A., Abdulrahman Jairoun, A., Alkhoujah, S., Al-Hemyari, S. S., Al-Tamimi, S. K., ... Mothana, R. A. (2022). Prevalence, knowledge and potential determinants of COVID-19 vaccine acceptability among university students in the United Arab Emirates: findings and implications. *Journal of Multidisciplinary Healthcare*, 81–92.
- Shaw, W. S., Main, C. J., Findley, P. A., Collie, A., Kristman, V. L., & Gross, D. P. (2020). Opening the workplace after COVID-19: what lessons can be learned from return-to-work research? *Journal of Occupational Rehabilitation*, 30(3), 299–302. <https://doi.org/10.1007/s10926-020-09908-9>
- Tam, C. C., Qiao, S., & Li, X. (2022). Factors associated with decision making on COVID-19 vaccine acceptance among college students in South Carolina. *Psychology, Health & Medicine*, 27(1), 150–161. <https://doi.org/10.1080/13548506.2021.1983185>
- Taylor, T., Das, R., Mueller, K., Pransky, G., Christian, J., Orford, R., & Blink, R. (2020). Safely returning America to work: part I: general guidance for employers. *Journal of Occupational and Environmental Medicine*, 62(9), 771–779. <https://doi.org/10.1097/JOM.0000000000001984>
- Vargo, D., Zhu, L., Benwell, B., & Yan, Z. (2021). Digital technology use during COVID-19 pandemic: A rapid review. *Human Behavior and Emerging Technologies*, 3(1), 13–24. <https://doi.org/10.1002/hbe2.242>
- Verhelle, H., Vertommen, T., & Peters, G. J. Y. (2022). Preventing sexual violence in sport: determinants of positive coach-bystander behavior. *Frontiers in Psychology*, 4282. <https://doi.org/10.3389/fpsyg.2022.862220>
- Vicente-Saez, R., & Martinez-Fuentes, C. (2018). Open Science now: A systematic literature review for an integrated definition. *Journal of Business Research*, 88, 428–436.
- Volpp, K. G., Loewenstein, G., & Buttenheim, A. M. (2021). Behaviorally informed strategies for a national COVID-19 vaccine promotion program. *Jama*, 325(2), 125–126.

- Wang, P. W., Ahorsu, D. K., Lin, C. Y., Chen, I. H., Yen, C. F., Kuo, Y. J., ... Pakpour, A. H. (2021). Motivation to have COVID-19 vaccination explained using an extended protection motivation theory among university students in China: the role of information sources. *Vaccines*, *9*(4), 380. <https://doi.org/10.3390/vaccines9040380>
- Wang, Q., Yang, L., Jin, H., & Lin, L. (2021). Vaccination against COVID-19: A systematic review and meta-analysis of acceptability and its predictors. *Preventive Medicine*, *150*, 106694.
- Wen, J., Wang, W., Kozak, M., Liu, X., & Hou, H. (2021). Many brains are better than one: The importance of interdisciplinary studies on COVID-19 in and beyond tourism. *Tourism Recreation Research*, *46*(2), 310–313. <https://doi.org/10.1080/02508281.2020.1761120>
- West, R., Michie, S., Rubin, G. J., & Amlôt, R. (2020). Applying principles of behaviour change to reduce SARS-CoV-2 transmission. *Nature Human Behaviour*, *4*(5), 451–459. <https://doi.org/10.1038/s41562-020-0887-9>
- Wight, D., Wimbush, E., Jepson, R., & Doi, L. (2016). Six steps in quality intervention development (6SQuID). *Journal of Epidemiology and Community Health*, *70*(5), 520–525.
- Wismans, A. B., Letina, S., Thurik, R., Wennberg, K., Baptista, R., Barrientos Marín, J., ... Torrès, O. (2020). Hygiene and social distancing as distinct public health related behaviours among university students during the COVID-19 pandemic. *Social Psychological Bulletin*, *15*(4). <https://doi.org/10.32872/spb.4383>
- Wright, L., & Fancourt, D. (2021). Do predictors of adherence to pandemic guidelines change over time? A panel study of 22,000 UK adults during the COVID-19 pandemic. *Preventive Medicine*, *153*, 106713.

Summary

Summary

In December 2019, the first official COVID-19 case was identified in China. Only a few months later, in February 2020, the Netherlands announced its first COVID-19 case. The worldwide spread of the virus was unprecedentedly fast and led the World Health Organization to declare COVID-19 a pandemic in March 2020. Shortly after, the Dutch government introduced the first nationwide lockdown that caused the closures of non-essential stores, cafes, restaurants, schools, and universities. To prevent any delays in education, universities delivered education entirely online until the end of the academic year 2019–2020. Due to the decrease in the number of cases and hospitalizations, the Dutch government relaxed the measures in the summer of 2020. Maastricht University (the Netherlands) decided to offer a hybrid education in the academic year 2020–2021. This decision also brought the responsibility of creating a safe environment for students and employees. In addition to various teams ensuring safety, the University Board requested support from our team during their decision-making processes in combatting the COVID-19 pandemic in the university. This dissertation demonstrates how a team of experts in behavior change, health and applied social psychology, health promotion and education, and epidemiology supported the University Board in response to a global health crisis. It describes the studies that have been conducted and interventions that have been developed.

Chapter 1 presents an introduction to the problem and context, the approach that had been taken, and the studies and interventions that are described in this dissertation. In the first year of the pandemic, without the availability of vaccines and medical treatments, the focus was on preventive behaviors, such as distancing, testing, and isolation. While offering a hybrid education, in addition to the infrastructural changes, Maastricht University enforced certain COVID-19 guidelines within the university. These guidelines were in line with the Dutch government's advice and intended to increase the safety of students by minimizing the spread of the virus as much as possible. However, the success of achieving this goal was also dependent on students' adherence to those guidelines. Hence, we conducted Studies 1 and 2 (**Chapters 2 and 3**) to gain an understanding of the factors that determine students' adherence to guidelines. In **Chapter 2**, we present a study that was aimed to assess students' adherence to COVID-19 guidelines of the university and identify factors that facilitated or hindered adherence. We conducted on-site and online focus group interviews with students on the topics of general COVID-19 guidelines of the university, and more specifically, keeping distance, staying at home and getting tested when having symptoms, and wearing facemasks. Moreover, we conducted online interviews

with stewards and security officials to gather more information about students' (non) adherence behaviors. Stewards and security officials were employed by the university to provide surveillance, in this case preventing crowds while students are leaving the classrooms. The findings of this study demonstrated that the interviewed students were willing to adhere to the guidelines of the university. Certain facilitators, such as the infrastructure of the buildings and staff, and barriers, such as difficulties with telling other students to follow guidelines, were mentioned as determinants of their adherence behavior. Interviews with stewards/security were in line with the findings from the interviews with students, that students were willing to follow the guidelines but struggled to do so in certain situations, such as a decrease in the distancing before and after the lectures. This qualitative study provided information on determinants of students' adherence to guidelines.

In **Chapter 3**, an online cross-sectional survey (Oct–Nov 2020) is presented, which aimed to further explore behavioral determinants (and underlying beliefs) of university students' adherence to COVID-19 guidelines, including keeping 1.5 m distance, avoiding crowds, getting tested, and isolating, and select the most relevant ones as input for future interventions. Attitude, perceived norm, self-efficacy, and several beliefs, such as risk perception beliefs (e.g., "I am not afraid because I am young"), attitudinal beliefs (e.g., "I feel responsible for telling people to adhere to guidelines"), self-efficacy beliefs (e.g., "COVID-19-prevention guidelines are difficult to adhere") were selected as the targets of a brief intervention, a Christmas/New Year message to students, to provide them support for having a safe festive break.

After December 2020, several COVID-19 vaccines became available, and with that, the new challenge was to achieve high vaccination uptake to open up society again. The Dutch government first started vaccinating the vulnerable populations, elderly people, and healthcare professionals. The next groups were invited by their age in a descending order. Therefore, university students were close to the bottom of the priority list. To support students in their vaccination decision, we aimed to develop an intervention (**Chapters 4 and 5**). We first aimed to gather information on students' vaccination intention and its determinants. Hence, in **Chapter 4**, we describe an online cross-sectional survey with Maastricht University students in March 2021 to explore university students' COVID-19 vaccination intention and select the most relevant determinants/beliefs. The findings demonstrated that 80% of students intended to vaccinate against COVID-19, and the most relevant determinants, that were associated with vaccination intention and had room for improvement, were concerns about safety and side effects of the vaccine, and trust in government, quality control, and the pharmaceutical industry. Other relevant determinants/beliefs were risk

perception, attitude, perceived norm, and self-efficacy beliefs. Based on the findings of this study and following the *Intervention Mapping* framework, we developed an online intervention that went online once students were eligible to vaccinate and aimed to support students in their vaccination decisions. **Chapter 5** provides information on the development and implementation of the vaccination intervention and lessons learned from the speedy process.

In June 2021, leaving one academic year behind in tackling the COVID-19 pandemic, COVID-19 vaccines were available and accessible. However, this did not guarantee the end of the COVID-19 pandemic. Therefore, universities were still required to prepare for the new academic year (2021–2022) under the new circumstances, i.e., improvements in vaccination coverage and the pandemic course, but also uncertainties due to the new variants. With all that in mind, universities were willing to invite students and personnel to campus in September 2021. To make a smooth transition ‘from online to on-site’, it was deemed important to explore personnel’s beliefs about returning to campus and their perceptions of a safe working environment. Hence, in **Chapter 6**, we present an online survey among Maastricht University personnel in June 2021 to investigate personnel’s beliefs about a safe return to campus in the new academic year. Based on the findings of this study, about 95% of personnel were already vaccinated or willing to do so. Over half of the respondents (58%) found the university a safe place to return to work in the new academic year (2021–2022). The group who felt relatively more unsafe indicated that it is too risky to return to campus in September 2021, and they were worried about getting infected. The group who felt safe, on the other hand, indicated that it is certainly possible to return to campus, and they trust others’ adherence to the guidelines. In addition, the findings demonstrated that most personnel preferred a transition period to get accustomed to the new work environment after working one year at home. The findings of this study were translated into practical recommendations to support the University Board in their preparation to organize research and teaching in the academic year 2021–2022. In addition to the recommendations, a brief intervention, a webinar discussing the Board’s plans for safe return and making a link with the findings of this study, was developed, and implemented.

In **Chapter 7**, the main findings of the studies in this dissertation are summarized. The methodological, practical, and future considerations are discussed, such as 1) the need for speeding up the planning process of interventions to provide a timely response, 2) the need for monitoring of behaviors and their determinants, 3) the urgency of implementation over evaluation in times of crisis, 4) the involvement of stakeholders in planning, and 5) adoption of open science principles.

Samenvatting

Samenvatting

In december 2019 werd in China het eerste geval geïdentificeerd van een persoon die positief testte op COVID-19. Slechts enkele maanden later, in februari 2020, werd het eerste COVID-19 geval in Nederland bekendgemaakt. De wereldwijde verspreiding van het virus ging vanaf dat moment onverwachts snel en in maart 2020 bestempelde de Wereld Gezondheid Organisatie (WHO) COVID-19 als een pandemie. Kort daarna introduceerde de Nederlandse overheid de eerste landelijke lockdown, wat leidde tot sluiting van niet-essentiële winkels, cafés, restaurants, scholen en universiteiten. Om studievertraging te voorkomen gingen de universiteiten volledig over op online onderwijs, tot het eind van het studiejaar 2019–2020. Toen daarna het aantal COVID-19 gevallen en gerelateerde ziekenhuisopnames weer afnam, werden die maatregelen door de Nederlandse overheid weer wat afgezwakt. De Universiteit Maastricht (UM) ging voor het academisch jaar 2020–2021 eerst over op hybride onderwijs (online en on-site). Daarmee nam de UM ook de verantwoordelijkheid op zich voor het creëren van een veilige omgeving voor de studenten en het personeel die naar de UM kwamen. Naast het implementeren van verschillende veiligheidsmaatregelen en het houden van toezicht om de veiligheid te bevorderen, vroeg het universiteitsbestuur onze groep om hulp bij de besluitvorming over hoe de COVID-19 pandemie binnen de universiteit kon worden bestreden. In dit proefschrift wordt uiteengezet hoe een team van deskundigen (toegepaste en gezondheidspsychologie, gezondheidsvoorlichting en -bevordering en epidemiologie) het universiteitsbestuur ondersteunde bij het zo goed mogelijk omgaan met deze wereldwijde crisis. Onderdeel daarvan was het uitvoeren van een aantal empirische studies, steeds gevolgd door de ontwikkeling van planmatige interventies voor gedragsverandering.

Hoofdstuk 1 bevat een introductie van het probleem en de context van COVID-19, de wijze waarop dat probleem is benaderd, en de verschillende studies en interventies die in dit proefschrift worden beschreven. In het eerste jaar van de pandemie, toen er nog geen vaccinaties waren, en ook nog geen effectieve medische behandeling, lag de focus op preventief gedrag, zoals afstand houden, testen en isolatie bij klachten. Op dat moment koos de UM voor hybride onderwijs, in combinatie met een aantal infrastructuurle maatregelen, werden ook een aantal gedragsregels binnen de gebouwen van kracht. Die gedragsregels volgden de richtlijnen van de overheid en hadden als doel de veiligheid van studenten (en medewerkers) te bevorderen door de verspreiding van het virus zoveel mogelijk tegen te gaan. Het succes van die maatregelen was afhankelijk van de mate waarin studenten zich daaraan zouden houden. Daarom zijn twee studies uitgevoerd (**Hoofdstukken 2 en 3**) om een beter beeld te krijgen van de factoren die bepalen hoe goed de studenten zich hielden aan die gedragsregels.

In **Hoofdstuk 2** wilden we als eerste te weten komen in hoeverre studenten zich hielden aan de COVID-19 gedragsregels binnen de UM en welke versterkende of verstorende factoren daarbij een rol speelden. Eerst hielden we online en on-site focusgroep-interviews met studenten over de algemene COVID-19 gedragsregels op de UM en daarna, meer specifiek, over afstand houden, thuisblijven en testen bij klachten, en het dragen van gezichtsmaskers. Bovendien voerden we enkele online interviews met COVID-19 stewards en veiligheidsfunctionarissen om nog meer te weten te komen over het wel of niet volgen van de gedragsregels (stewards en veiligheidsfunctionarissen waren ingehuurd door de UM om te surveilleren en, bijvoorbeeld, te voorkomen dat er drukte ontstaat wanneer studenten uit de collegezalen komen). De uitkomsten van deze studie laten zien dat de geïnterviewde studenten bereid waren zich aan de richtlijnen van de UM te houden. Soms werden bevorderende factoren genoemd, zoals de infrastructuur van gebouw en het personeel; soms belemmerende factoren zoals anderen erop wijzen zich aan de regels te houden. De uitkomsten van de interviews met de stewards en veiligheidsfunctionarissen kwamen overeen met die van de studenten; studenten waren bereid zich aan de regels te houden maar vonden dat soms lastig, bijvoorbeeld bij het binnengaan en naar buiten gaan van collegezalen. Deze kwalitatieve studie verschaftte voldoende informatie voor het uitvoeren van een volgende, kwantitatieve studie over de mate waarin studenten zich aan de gedragsregels houden.

In **Hoofdstuk 3** beschrijven we een cross-sectionele vragenlijststudie, gehouden in oktober–november 2020, waarmee we nader exploreerden wat de gedragsdeterminanten waren (en de onderliggende opvattingen) van de mate waarin UM-studenten zich hielden aan de gedragsregels, o.a. 1.5 meter afstand houden, vermijden van drukte, zich laten testen en isoleren bij klachten, om zo de meest belangrijke te kunnen selecteren voor er op volgende interventies. Attitudes, waargenomen normen, eigen-effectiviteit en een aantal specifieke opvattingen zoals over risico (bijv. “Ik ben niet bang want ik ben jong”), attitude (bijv. “Ik voel me verantwoordelijk om anderen erop te wijzen zich aan de regels te houden”), eigen-effectiviteit (bijv. “De COVID-regels zijn lastig op te volgen”) werden geselecteerd als doelen van een korte interventie: een Kerst/Nieuwjaarsboodschap aan studenten om hen te ondersteunen bij het hebben van een veilige kerstvakantie.

Na december 2020 kwamen verschillende vaccins beschikbaar, en daarmee de nieuwe uitdaging om zoveel mogelijk mensen zich te laten vaccineren, zodat de samenleving weer wat meer open kon. De Nederlandse overheid startte vaccinatie bij kwetsbaren, ouderen en personeel in de gezondheidszorg. Daarna werd de rest uitgenodigd in (afnemende) volgorde van leeftijd. Studenten kwamen daarom pas later

aan de beurt. Om studenten te ondersteunen bij hun vaccinatiebeslissing, wilden we een interventie ontwikkelen (**Hoofdstukken 4 en 5**). Allereerst wilden we informatie verzamelen over de vaccinatie-intentie van studenten en de onderliggende opvattingen daarover. Daarom beschrijven we in **Hoofdstuk 4** een online cross-sectionele studie onder Maastrichtse studenten, gehouden in maart 2021, om hun vaccinatie-intenties te inventariseren, plus de belangrijkste onderliggende determinanten (en opvattingen). De uitkomsten van deze studie lieten zien dat 80% van de studenten van plan was zich te laten vaccineren tegen COVID-19. De belangrijkste, en potentieel veranderbare determinanten waren: zorgen over de veiligheid en over bijverschijnselen, vertrouwen in de overheid, kwaliteitscontrole van het vaccin, en de rol van de farmaceutische industrie. Andere belangrijke determinanten en onderliggende overtuigingen betroffen risicoperceptie, attitude, waargenomen normen en eigen-effectiviteit. Op basis van deze uitkomsten werd het *Intervention Mapping* protocol gevolgd en ontwikkelden we een interventie die online werd gedeeld op het moment dat studenten aan de beurt waren voor vaccinatie, om hen te helpen bij de beslissingen omtrent vaccinatie. In **Hoofdstuk 5** wordt beschreven hoe die interventie op korte termijn is ontwikkeld en geïmplementeerd en welke lessen zijn geleerd van dit versnelde proces.

In juni 2021, na een jaar van omgaan met COVID-19, was het voor iedereen mogelijk om te vaccineren. Daarmee was de COVID-19 pandemie echter nog niet achter de rug. De universiteiten moesten nog steeds plannen maken voor het nieuwe academische jaar (2021–2022) onder deze nieuwe omstandigheden. Enerzijds werden vaccinaties beter en was er een afname van de pandemie. Anderzijds waren er onzekerheden vanwege mogelijke nieuwe varianten van het virus. In deze situatie besloot de UM om, in september 2021, studenten en medewerkers weer op de campus te laten komen. Om de overgang te versoepelen leek het gewenst om de opvattingen van het personeel te inventariseren over een 'veilige terugkeer naar de werkomgeving'. Daarom wordt in **Hoofdstuk 6** gerapporteerd over een onderzoek onder het UM-personeel met een online vragenlijst, in juni 2021, naar hun opvattingen over een veilige terugkeer naar de campus in het nieuwe academische jaar. Uit het onderzoek bleek dat ongeveer 95% van de medewerkers al gevaccineerd was, of bereid was dat te doen. Meer dan de helft (58%) meende dat de UM wel een veilige werkplek was om weer aan het werk te gaan in het nieuwe academische jaar 2021–2022. De groep die het niet helemaal veilig vond, gaf aan dat het in september 2021 nog te riskant was om terug te komen, en dat ze bezorgd waren een COVID-19 infectie op te lopen. De groep die het veilig vond, was daarentegen van mening dat het zeker mogelijk was weer naar de campus te komen en ze vertrouwden erop dat anderen zich (ook) aan de richtlijnen zouden houden. Daarnaast vonden veel deelnemers het wel gewenst dat er een soort transitiefase zou

komen om weer te wennen aan de nieuwe werkomgeving na een jaar thuiswerken. De uitkomsten van de studie werden geformuleerd als aanbevelingen voor het UM-bestuur ter voorbereiding van het academische jaar 2021–2022. In aanvulling op deze aanbevelingen werd ook een interventie ontwikkeld en uitgevoerd, nl. een *webinar* waarin de uitkomsten van het onderzoek en de plannen van het bestuur werden bediscussieerd.

In **Hoofdstuk 7** worden de belangrijkste resultaten van de studies in dit proefschrift samengevat. Methodologische, praktische en toekomst-gerelateerde overwegingen worden besproken, zoals (1) de noodzaak om als dat nodig is heel snel een planmatige interventie te ontwikkelen, (2) de noodzaak om gedrag en determinanten te kunnen monitoren, (3) de urgentie van implementatie boven evaluatie in tijden van crisis, (4) de noodzaak om alle stakeholders te betrekken bij de planning en (5) te werken volgens ‘*open science*’ principes.

Impact Paragraph

Impact Paragraph

The COVID-19 pandemic entered our lives in early 2020. Governments worldwide implemented measures that also included lockdowns in an effort to control the number of cases and hospitalizations. In the first year of the COVID-19 pandemic, as well as in the absence of vaccines, these measures, such as distancing, testing, isolating, and using face masks, were mainly dependent on people's adherence to these guidelines. The current PhD project was initiated in September 2020, when the Maastricht University Board decided to offer hybrid education in the academic year of 2020–2021 and involved experts from different disciplines who worked towards one goal — supporting the Maastricht University Board when tackling the COVID-19 pandemic within the university.

As the COVID-19 pandemic trajectory was unprecedented, the objectives of the project evolved as the situation developed. The project timeline can be divided into three periods: 1) The first period covered September–December 2020, when the university decided to offer hybrid education. During this period, we conducted studies with students to gain an understanding of their adherence to the university's COVID-19 guidelines and the factors related to their adherence. Furthermore, based on the findings of these studies, we aimed to inform the development of an intervention to facilitate students' adherence to COVID-19 guidelines of the university. 2) The second period covered January–July 2021, when education moved online again due to the lockdown installed by the government, but also when the Dutch vaccination rollout started. During this period, we conducted a study on students' vaccination intention and their reasons to vaccinate and/or not to vaccinate, and based on the findings of this study, we developed an intervention to support students in their vaccination decisions. 3) The third and last period covered May–September 2021, a time when the vaccination uptake increased in the Netherlands and society started opening again. During this period, we conducted a study to explore the university employees' feelings about returning to campus in September. Based on the findings of this study, an intervention was implemented to address the employees' concerns about returning to on-campus work and provide information on what to expect in the new academic year.

Scientific Impact

This dissertation contributed to the empirical literature on COVID-19 by providing information on 1) the adherence of university students to COVID-19 preventive behaviors and the factors that influence their adherence, 2) the COVID-19 vaccination

intentions of university students and the factors that influence these intentions, 3) the safety feelings of university employees when returning to on-campus work, 4) behavior-change interventions developed for these topics, which can be used by other university boards with similar groups in the future or adapted according to the needs of other target groups in the context of the COVID-19 pandemic or other pandemics with similar behaviors, and 5) lessons learned about how to speed up the intervention development process in times of need.

The findings of this dissertation highlighted the importance of just-in-time interventions in times of crisis, such as the COVID-19 pandemic. These interventions, which are designed to be implemented timely and effectively in response to a crisis, can help mitigate the negative impacts of the crisis on individuals and communities. We also discussed future research considerations for pandemic and crisis preparedness, such as a need for monitoring. By understanding the most effective ways to develop and implement interventions, public health officials can provide a timely response in times of crisis and more effectively protect the health and well-being of the population.

The studies and interventions were presented at national and international conferences and at the faculty “science day” of the Faculty of Psychology and Neuroscience of Maastricht University. Moreover, our studies were published with open access in scientific journals. If there were no ethical obligations, data and study materials were publicly shared, and preprints were published to support other scientists and relevant stakeholders in accessing the findings in a timely manner. This can facilitate transparency, collaboration, and knowledge-building in the field.

Societal Impact

Our research assisted the University Board in times of global health crisis. Input from students and employees guided the problem analysis and the development of theory- and evidence-based interventions. The findings of our studies informed the university-wide decisions and communications when tackling the COVID-19 pandemic within the university. After each study, we issued a report to the University Board that included the study findings and recommendations. Moreover, with our studies and interventions, we aimed to promote COVID-19 preventive behaviors among students, such as distancing. We also aimed to facilitate a sense of safety within the university among students and employees. These efforts were intended to help reduce the spread of the virus and protect the health of the university community. Our research results are relevant for researchers, university boards, policymakers, university students, and staff. Although it can be argued that the COVID-19 pandemic is behind us because we are

back to normal again but at the same time is still with us because we can still catch and spread the virus, this dissertation might help for future crisis preparedness and management, as the COVID-19 pandemic was new to some of us but might not be last.

Conclusion

In times of crisis, acting fast is important due to continuously changing conditions. We argue that prompt and sound response may require 1) forming a project group with experts from disciplines relevant to the problem, 2) involving the target group and relevant stakeholders from the beginning of the project to gather their input and inform the intervention accordingly, 3) building a trust relationship with the stakeholders, 4) identifying and using existing resources, 5) following an intervention development framework to systematically develop interventions, 6) using empirical evidence and theories, 7) gathering information from similar problems if there is no or limited literature on the problem, 8) prioritizing the implementation over evaluation in cases of need and changing situations, and 9) sharing data and findings with scientists and stakeholders.

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Curriculum Vitae

Curriculum Vitae

Tugce Varol was born in Bolu, Turkey on March 26, 1995. When she was four years old, she moved to Ankara with her family. She attended high school at Ankara Atatürk Anadolu Lisesi and later received her bachelor's degree in Psychology from Bilkent University in Turkey in 2019. During her bachelor's degree, Tugce spent five months studying abroad as an exchange student at Tilburg University in the Netherlands in 2018. She then obtained her master's degree in Health and Social Psychology at Maastricht University, The Netherlands. As of completing her master's degree in September 2020, she was initially employed as a Junior Researcher, and after one year, she continued working as a PhD student in the Department of Work and Social Psychology at Maastricht University. As of January 2023, she has been employed as Postdoctoral Researcher at Maastricht University.

