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FULL PAPER

Dynamic norms for dynamic times? An experiment on the effects of dynamic and static norms messages on COVID-19 vaccination intention

Dynamische Normen für dynamische Zeiten? Ein Experiment zu den Effekten dynamischer und statischer Normbotschaften auf die COVID-19-Impfabsicht

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Abstract: Social norms messages may motivate COVID-19 preventive behaviors, such as getting vaccinated. To date, however, the research has mainly focused on the established concept of static norms and widely ignored the potential of dynamic norms. Dynamic norms convey information about how norms are developing over time and have been shown to promote change when the behavior is not yet the majority norm. The present study investigated the potential of dynamic norms in the context of the COVID-19 vaccination campaign. It examined (a) the effects of static and dynamic norms messages on vaccination intention, (b) the mechanisms through which dynamic norms may influence vaccination intention, and (c) the potential of dynamic norms to increase vaccination intention of vaccine-hesitant people. We conducted a preregistered online experiment with three conditions (static norm, dynamic norm, control message) among people who were not yet vaccinated (N = 2,289, 16–60 years) in May 2021, during the early vaccine roll-out period for the general population in Switzerland. We found no effects of exposure to the static or dynamic norms messages on vaccination intention and no specific influence mechanisms of dynamic norms (e.g., via perceived future norm) – neither for participants who were willing to get vaccinated nor for the vaccine-hesitant group. However, further analyses showed that, among vaccine-hesitant participants, the normative perception that formerly vaccine-critical people were changing their minds was correlated with a stronger vaccination intention. We discuss potential reasons why social norms messages did not show an effect in our study and derive theoretical and practical implications.

Keywords: Dynamic norms, static norms, vaccination intention, COVID-19, experimental design.

Zusammenfassung: Botschaften über soziale Normen können COVID-19-Präventionsverhalten, wie sich impfen zu lassen, fördern. Bislang hat sich die Forschung jedoch hauptsächlich auf das etablierte Konzept der statischen Normen konzentriert und das Potenzial dynamischer Normen weitgehend ignoriert. Dynamische Normen vermitteln Informationen darüber, wie sich die Normen im Laufe der Zeit entwickeln und fördern Veränderungen, wenn das Verhalten noch nicht die Mehrheitsnorm ist. In der vorliegenden Studie untersuchten wir das Potenzial dynamischer Normen im Rahmen der COVID-19-Impf-

kampagne. Konkret wurde untersucht, (a) welche Effekte statische und dynamische Normen auf die Impfabsicht haben, (b) über welche Mechanismen die dynamischen Normen auf die Impfabsicht wirken und (c) welches Potenzial dynamische Normen haben, die Impfabsicht von Personen zu erhöhen, die zögerlich bezüglich einer Impfung gegen COVID-19 sind. Hierfür führten wir ein präregistriertes Online-Experiment mit drei Bedingungen (statische Norm, dynamische Norm, Kontrollbotschaft) unter noch nicht geimpften Personen (N = 2.289, 16–60 Jahre) im Mai 2021, während der Einführungsphase des Impfstoffs für die allgemeine Bevölkerung in der Schweiz, durch. Unsere Ergebnisse zeigten keine Effekte statischer oder dynamischer Normen auf die Impfabsicht und keine spezifischen Einflussmechanismen dynamischer Normen (z. B. über die wahrgenommene zukünftige Norm) – weder für die Teilnehmenden, die bereit waren, sich impfen zu lassen, noch für die Gruppe der Zögerlichen. Weitere Analysen zeigten jedoch, dass bei den impfzögerlichen Teilnehmenden die normative Wahrnehmung, dass ehemals impfkritische Personen ihre Haltung ändern, mit einer stärkeren Impfabsicht korreliert war. Wir diskutieren mögliche Gründe, warum die Normbotschaften in unserer Studie keine Wirkung zeigten und leiten theoretische und praktische Implikationen ab.

Schlagwörter: Dynamische Normen, statische Normen, Impfintention, COVID-19, Experimentaldesign.

1. Introduction

The success of the national COVID-19 vaccination campaigns depends on people's willingness to be vaccinated. Although the concept of herd immunity is critically discussed, there is consensus that a high vaccination rate, along with other preventive measures, is the most promising way to save lives, protect health systems, and return to normality (Aschwanden, 2021). The idea of getting back to normal life, however, implies that people who are vaccine hesitant need to get vaccinated.

From a strategic communication perspective, social norms messages are a promising means to motivate COVID-19 preventive behaviors, such as getting vaccinated (Rimal & Storey, 2020). They convey information about the popularity of a behavior and have been shown to be effective in motivating individual behavior across various domains (e.g., health behaviors, sustainable behaviors; Rhodes et al., 2020). Because social norms provide orientation by indicating what others consider an effective and approved behavior, social norms are particularly influential when behavioral decisions must be made under perceived uncertainty – as during the COVID-19 pandemic (Rimal & Storey, 2020). Accordingly, health communication researchers and experts have recommended the use of social norms messages to encourage people to get vaccinated against COVID-19 (Chou et al., 2020; Lewandowsky et al., 2021).

Despite the potential of social norms, few studies have examined the effects of social norms messages on COVID-19 vaccination intention. Experimental studies to date show mixed results, ranging from moderate effects of messages about willingness to take the vaccine in the US (Palm et al., 2021), to very small effects of normative information about vaccination willingness in a 23 country study (Moehring et al., 2021), to no effects of norms-based messages compared to standard vaccine information among young people aged between 16 and 30 years

in the UK (Sinclair & Agerström, 2021). This initial and ambiguous evidence demonstrates the need for further research on social norms messaging to encourage vaccination against COVID-19.

The present experimental study examined the effects of social norms messaging on COVID-19 vaccination intention during the early stages of the vaccination campaign in Switzerland, in May 2021. It expands upon the research on social norms messages (Rhodes et al., 2020) by investigating the relatively new concept of dynamic norms (Sparkman & Walton, 2017; Mortensen et al., 2019). Whereas *static norm* messages describe the current willingness to get vaccinated in the population (e.g., "70% of the population wants to be vaccinated"), *dynamic norm* messages convey information about how the norm is developing over time (e.g., "More and more people want to be vaccinated"). While not yet tested in the context of vaccination intention, dynamic norm messages have been shown to be especially influential (i.e., compared to static norms) in other behavioral domains, such as sustainable behavior (e.g., Sparkman & Walton, 2017). Given the steadily increasing willingness to get vaccinated since the approval of the first vaccines at the end of 2020 (e.g., COVID-19 Snapshot Monitoring [COSMO], 2021; CovidNorms, 2021), the concept of dynamic norms seems to be particularly appropriate and to hold significant potential for strategic communication in this context.

This article pursues three aims. First, it aims to compare the impact of static and dynamic norms on COVID-19 vaccination intention to learn about the relative potential of dynamic norms in increasing vaccination uptake. Second, it aims to understand the mechanisms through which dynamic norms may influence vaccination intention, such as leading people to perceive a stronger anticipated future norm and thereby a stronger desire to adhere to it (Sparkman & Walton, 2017). Third, the study tested the idea that dynamic norms are particularly impactful among people who are vaccine hesitant, as they might promote leeway for personal change (Sparkman & Walton, 2019). The findings of this study not only contribute to the current social norms research but also have important implications for communication strategies aimed at increasing vaccination uptake.

2. The COVID-19 vaccination campaign in Switzerland

By mid-December 2020, the first COVID-19 mRNA vaccine (i.e., BNT162b2 from Biontech/Pfizer) had received emergency-use authorization from the WHO (2020) as well as from several national regulatory authorities worldwide, as those in Switzerland (Swissmedic, 2020). From then on, the vaccination campaign started in Switzerland with initially prioritizing certain population groups, such as persons over 75 years and with chronic disease. With the approval and availability of other vaccines, prioritization was lifted in May 2021 and the general population was encouraged to get vaccinated (Federal Office of Public Health [FOPH], 2021).[1] This was the time of the end of the third COVID-19 wave in Switzerland: Though the infection numbers were slowly decreasing at this time, they were still

1 We note that at this time access to vaccination was still restricted for people under 50 years of age in a few cantons such as Geneva, Obwalden, Glarus, Nidwalden, and Ticino.

significant with 174.39 confirmed cases per million per day (7-day rolling average) and a case fatality rate of 1.58% in Switzerland (Ritchie et al., 2020). There were no vaccine passports or restrictions based on vaccine status in any public places at this time.

Although vaccination coverage increased steadily since the vaccine roll-out, it became apparent that there was a significant part in the population that was vaccine hesitant. Specifically, in May 2021, the time of this study, about one third of the population was vaccinated with at least one dose, while about a quarter was still undecided or against vaccination (Covid-Norms, 2021). It is notable that vaccine hesitancy in Switzerland is high also for other diseases, such as for HPV vaccines, which is, among other things, explained by a relatively high popularity and belief in complementary and alternative treatments (Zuzak et al., 2008). In this context, the present study tested the potential of social norms messaging to help increase uptake of the COVID-19 vaccine.

3. Social norms messages about COVID-19 vaccination intention

Social norms are defined as rules "that guide and/or constrain social behavior without the force of law" in social groups (Cialdini & Trost, 1998, p. 152). The groups that social norms refer to can be smaller groups of people, such as direct personal contacts, but also more abstract collectives, such as the entire society (Patrick et al., 2012, see also Geber & Sedlander, 2022). Social norms can be differentiated with regard to whether they are descriptive and refer to *what is done* or whether they are injunctive, specifying what *ought to be done* according to the group members (Cialdini et al., 1990). This differentiation has been established in the focus theory of normative conduct (Cialdini et al., 1990) and is widely applied in current social norms research (Rhodes et al., 2020; Shulman et al., 2017). Social norms are traditionally conceptualized as static norms – that is, as the *current* prevalence and social approval of a behavior (Shulman et al., 2017). It is only recently that the concept of dynamic norms (Sparkman & Walton, 2017), also referred to as trending norms (Mortensen et al., 2019), was introduced in social norms research. Dynamic norms refer to the "change of a norm over time instead of its current state" (Sparkman & Walton, 2017, p. 1663).

Research demonstrates that both descriptive and injunctive norms impact behavior, across various domains, including health behavior (Manning, 2009; Rhodes et al., 2020). More recently, social norms messages have been applied to the COVID-19 pandemic. Initial experimental studies on the effects of social norms messages on vaccination intention found mixed results, ranging from moderate to no effects (Moehring et al., 2021; Palm et al., 2021; Sinclair & Agerström, 2021). Dynamic norms, on the other hand, have been mainly investigated in the context of sustainable behaviors, such as meat consumption (Sparkman & Walton, 2017), water conservation (Mortensen et al., 2019), or avoidance of disposable to-go-cups (Loschelder et al., 2019). However, the impact of dynamic norms have not yet been tested on COVID-19 vaccination intention. Dynamic norm messages may hold significant potential for strategic communication given the dynamic

development of the COVID-19 pandemic and changes over time in the willingness to get vaccinated.

4. Effects of norms messages on COVID-19 vaccination intention

To understand the potential of social norms messages to increase vaccination uptake, we examined (a) the effects of exposure to static and dynamic norms messages on vaccination intention, (b) the mechanisms through which dynamic norm messages may impact vaccination intention, and (c) the potential of dynamic norms to increase the vaccination intention of vaccine-hesitant people.

To this end, we focused on *descriptive* norms instead of injunctive norms, and on the *population* instead of personal contacts for three reasons. First, the success of the vaccination campaign depends on high rates of vaccination in the entire population. Thus, getting vaccinated can be understood as a cooperative behavior (Diekmann, 2020); the more people in the population that get vaccinated, the more effective it is. Second, the public discussion on vaccination has focused on descriptive norms in the population (e.g., "Vaccination willingness in Switzerland increases markedly", Schneider, 2021). Hence, the examination of normative information about the population's vaccination willingness provides insights into the impact of messages that appeared in the media and may have impacted individuals' decisions of whether or not to get vaccinated. Third, research on both social norms messages on COVID-19 vaccination intention (Moehring et al., 2021; Palm et al., 2021; Sinclair & Agerström, 2021) and on dynamic norm messages (e.g., Sparkman & Walton, 2017) have focused on descriptive norms and the population as reference group. The focus on population-related descriptive norms helps to discuss the study's results in the context of the existing literature.

4.1 Effects of dynamic norms compared to static norms

We expected that social norms messages about the vaccination intention in the population have the potential to increase vaccination intention of individuals during the current COVID-19 pandemic, because norms provide social proof that getting vaccinated is the right thing to do (Cialdini et al., 1990). Further, we assumed that dynamic norms have a special potential to increase vaccination intention, meaning that we expected them to be more influential than static norms. The idea here is that the current prevalence is not the only information that is valuable to a person interested in making a good decision. The *trend* of this popularity might be even more informative, especially when the context is changing and behavior needs to be dynamically adapted (Mortensen et al., 2019). This also applies to the development of the COVID-19 pandemic and the evolving scientific evidence behind the vaccines. Overall, the state of research highlights the persuasive impact of dynamic norms and their relatively greater impact compared to static norms (Mortensen et al., 2019; Sparkman & Walton, 2017, 2019). We state the following hypothesis:

H1: Exposure to either a static or dynamic norm message will increase the intention to get vaccinated more than exposure to a control informational message. Exposure to a dynamic norm message will increase the intention to get vaccinated more than exposure to a static norm message.

4.2 Mechanisms of the impact of dynamic norms

Dynamic norms point to an ongoing trend, in the current case, people's increasing willingness to get vaccinated. Past work shows that people assume change in one direction will continue in that direction (Hubbard, 2015) and that potential outcomes that are increasing in probability feel more imminent (Maglio & Polman, 2016). Thus, portraying the willingness to get vaccinated as increasing in a population may create a perception of a stronger future vaccination norm, which will, in turn, exert a stronger influence on vaccine intention, as demonstrated by Sparkman and Walton (2017) in the case of eating less meat. Thus, we hypothesize that an increase in vaccination intention is mediated by a perceived higher future norm of vaccination and state the following hypothesis:

H2: The impact of the dynamic norm message on the increase in vaccination intention will be mediated by a perceived future norm of vaccination in the population. That is, the dynamic norm message will increase the perceived future norm of vaccination in the population, which will lead to an increased vaccination intention.

The dynamic norm and anticipation of an ongoing trend are particularly meaningful in the present case, as this anticipation may align with the idea of reaching the collective goal of getting back to normal life. More concretely, this collective goal relates to entering a new phase of the pandemic with consistently decreasing rates of cases and eased measures. Thus, we assume that the dynamic norm message may influence the perception that people are engaging in this collective effort in increasing numbers and that the problem of the pandemic can be solved, which may motivate people to contribute to this collective goal (Sparkman et al., 2021). We thus state the following hypothesis:

H3: The impact of the dynamic norm message on increasing vaccination intention will be mediated by the perception of reaching the collective goal of getting back to normal life. That is, the dynamic norm message will increase the perception that the collective goal can be reached, which will increase vaccination intention.

4.3 Impact of dynamic norms among people who are vaccine hesitant

Dynamic norms, relative to static norms, might be especially powerful among those who are vaccine hesitant. Dynamic norms provide information about how others' decisions are changing over time and, thus, may influence how people think about the prospect of personal change (Sparkman & Walton, 2019). More concretely, by learning about changes others are making, people may begin to

consider their own personal changes and might get motivated to overcome perceived barriers. The focus theory of normative conduct (Cialdini et al., 1990) suggests that norms motivate behavior primarily when they are activated (i.e., made salient or otherwise focused on). The dynamic norm message, unlike the static norm message, inclines individuals to focus their attention on the change component. Because change would be necessary by those who are vaccine hesitant and not by those who are vaccine willing, and the dynamic norm message activates the normative belief in change, we expect that the distinct effect of dynamic norms (as compared with static norms) becomes especially apparent among people who are vaccine hesitant. Thus, we state the following hypothesis:

> *H4: Compared to participants who are willing to be vaccinated, participants who are vaccine hesitant will be more likely to increase their vaccination intention after they are exposed to the dynamic norm message vs. the static norm message. That is, compared to the static norm message, the dynamic norm message will be particularly effective in increasing vaccination intention among participants who are vaccine hesitant.*

Vaccine-hesitant people might perceive that getting vaccinated is incompatible with their current attitude. The persuasive idea of a dynamic norm message therefore is not to focus on promoting a conflicting attitude but to emphasize that others have changed their minds. Ideally, people who are vaccine hesitant perceive a norm of change among like-minded people when being exposed to the dynamic norm message. Following the basic idea of normative influences as stated in the theory of normative conduct (Cialdini et al., 1990), this perceived norm of change in vaccination intention (descriptive norm) and attitudes (injunctive norm) motivates people who are vaccine hesitant to change, because change might be perceived as effective and appropriate. Thus, we suppose that perceptions of descriptive and injunctive norms of change are a crucial reason why dynamic norm messages unfold their potential among people who are vaccine hesitant, and we state the following hypothesis:

> *H5: Compared to participants who are willing to get vaccinated, for participants who are vaccine hesitant, the effect of the dynamic norm message on vaccination intention will be mediated by their perceptions of (a) a descriptive and (b) an injunctive norm of change among other people who are vaccine hesitant.*

5. Methods

5.1 Design

To test our hypotheses on the effects of static and dynamic messages (H1), dynamic norms' influence mechanisms (H2, H3), and their potential among vaccine-hesitant people (H4, H5), we conducted an online experiment from 5 May to 16 May 2021, during the early vaccine roll-out period for the general population in Switzerland. The study's design was guided by the idea of achieving high external

validity. We therefore (a) presented norms messages on posters adapted from official communication material of the Swiss national health authority, (b) used norms messages that reflected the actual vaccination rate in the population at the time of data collection, and (c) tested the messages under the given developments of the pandemic.

We applied a randomized three-condition pretest-posttest design. Participants were randomly allocated to exposure to the static norm (condition 1), dynamic norm (condition 2), or control message (condition 3). Vaccination intention was measured before and after message exposure. This design was based on previous studies of dynamic norms (e.g., Mortensen et al., 2019; Sparkman & Walton, 2017), in which online survey participants were typically exposed one time to either a static, dynamic, or control text message and then asked questions about their behavioral intention as outcome.

The design promised to be applicable and particularly insightful in the present case because of the dynamic development of the pandemic and of the vaccination campaign specifically. This dynamic came along with uncertainty on the side of the population, regarding the pandemic development and related regulations and especially concerning the COVID-19 vaccination. In the present study, we also asked people about their reasons for not getting vaccinated (after the experiment). The most common reasons were side-effect concerns (64%), safety concerns (62%), and effectiveness concerns (54%) (Hitchman et al., 2021). Furthermore, nearly 40% of people who were not vaccinated and had no plans to be vaccinated, gave the reason that they would decide later about getting vaccinated (Hitchman et al., 2021). Thus many people's intentions were not stable and normative information about what others are doing may provide important orientation in such a situation of high uncertainty. Furhermore, studies on misinformation and messages counteracting informational deficiencies found effects on COVID-19 vaccination intention in a single-message design (Argote Tironi et al., 2021; Loomba et al., 2021). For these reasons, we expected that a single exposure to a social norms message would give us first insights into the potential effectiveness of dynamic norms messages for increasing vaccination uptake.

5.2 Procedure

After participants provided informed consent, information on age, gender, and education, and pretest vaccination intention was collected. Between the pretest measure of vaccination intention and exposure to one of the vaccination messages, several other questions unrelated to vaccination were asked (e.g., media use). Participants were then exposed for at least ten seconds to one of three posters with either a static, dynamic, or control message as shown in Figure 1, and were asked to answer several distractor questions about the poster's design. Then participants' posttest vaccination intention was measured with subsequent questions for measuring the hypothesized mediators (e.g., perceived future norm). The mean time taken to complete the survey was about 22 minutes (excluding outliers). The procedure and survey were approved by the ethics committee of the

University of Zurich. The hypotheses, study design, and analysis strategy were preregistered: https://bit.ly/3rmFo9E.

5.3 Sample

Participants were recruited from the national LINK online panel[2] and 2,289 completed the survey. Not included in this sample were participants who declined to provide informed consent, had already been vaccinated, or were over 60 years old. The age restriction has been defined because the commercial panel provider could not guarantee representativity for residents over 60 years of age. Participants were distributed evenly across the three conditions: static norm (n = 785), dynamic norm (n = 751), and control message (n = 753). The required sample size was determined by an a priori power analysis (see Faul et al., 2007) of the analysis of covariance design (ANCOVA) with power set at .90 to detect a small effect size of .10 at .05 alpha.

Within the sample, 46.9% of participants were male and 52.9% were female. Their mean age was 42.7 years (SD = 11.5). Regarding education, 2.2% had finished compulsory schooling, 58.3% had completed secondary education (i.e., vocational training, high school diploma), and 39.3% had completed tertiary education (i.e., university, higher vocational training). The distribution of sociodemographic characteristics closely follows the distribution in the Swiss population, with higher education groups being slightly overrepresented. Gender (Cramer's V (φc) = .01), age (φc = .03, 95% CI [0.00, 0.04]), and education (φc = .04, 95% CI [0.02, 0.05]) were evenly distributed across the three conditions (i.e., static norm, dynamic norm, and control message).

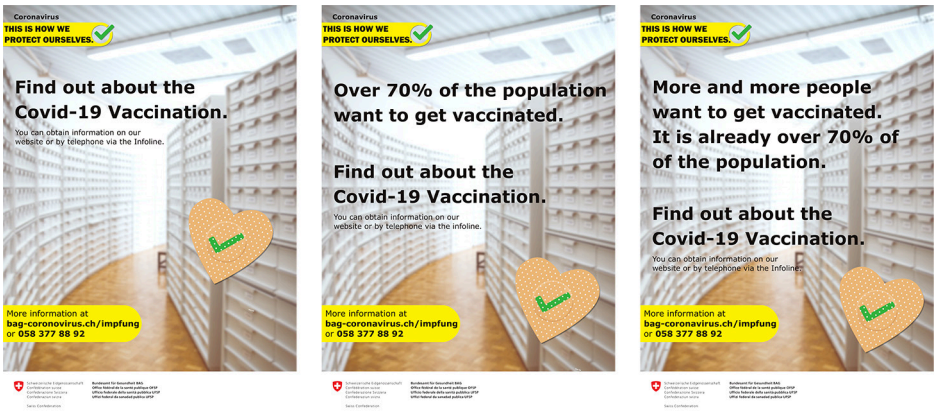
5.4 Measures

5.4.1 Norms messages

All messages (i.e., static norm message, dynamic norm message, control message) were presented in the form of a poster, which was designed to appear to be from the Swiss public health authority (see Figure 1).

2 The commercial panel comprised 115,000 members who were actively recruited in telephone surveys. Participants were contacted randomly via landline or mobile phone through random digit dialling. The recruitment procedure achieved a theoretical coverage of 98% of the population.

Figure 1. Poster with control message (left), static norm message (middle), and dynamic norm message (right)



Note. Posters adapted from official communication material of the Swiss public health authority. The messages and the use of the official logo were approved by the Swiss public health authority.

(A) *Static norm message:* The static norm message presented the share of the population that was willing to get vaccinated. The number represented the actual rate of people eligible for vaccination who were already vaccinated and who were willing to get vaccinated in Switzerland at the time of data collection (Covid-Norms, 2021). The message also included a call to get informed about COVID-19 vaccination, which was used as the control message but was also included in both the static and dynamic norm messages to ensure that its effect did not interfere with the experimental design. The static norm message reads, "Over 70% of the population is willing to be vaccinated. Find out more about the Covid-19 vaccine."[3]

(B) *Dynamic norm message:* The dynamic norm message was about the increasing vaccination intention in the population. Since it seemed possible that dynamic norms could influence perceptions of static norms (if a behavior is on the rise, people might infer that its current prevalence is high), we followed Sparkman and Walton (2019) and included the static norm information in the dynamic norm condition. This allowed us to test whether the dynamic norm condition caused change relative to the static norm message. The dynamic norm message read, "More and more people are willing to be vaccinated. It is already more than 70% of the population. Find out more about the Covid-19 vaccine."

(C) *Control message:* The control message was a call to seek information about vaccination: "Find out more about the Covid-19 vaccine." This call was also included in both other conditions for internal validity reasons.

3 In the survey, we used the spelling Covid-19 instead the scientific spelling COVID-19.

5.4.2 Vaccination intention

Vaccination intention was measured before and after message presentation by asking participants to answer "How likely it is that you would choose to get a Covid-19 vaccine in the coming week if you had the chance" on a Likert scale ranging from 1 = *under no circumstances* to 7 = *very likely* (pretest: $M = 4.51$, $SD = 2.30$; posttest: $M = 4.50$, $SD = 2.35$).

5.4.3 Perceived future norm of vaccination

The perceived future norm of vaccination in the population was measured by asking participants (posttest) what proportion of the population they think would get vaccinated or would already be vaccinated three months in the future (i.e., by the end of July). Participants provided their answer on a sliding scale ranging from 0 to 100% ($M = 68.57$, $SD = 15.23$).

5.4.4 Perception of reaching the collective goal

The perception of reaching the collective goal of getting back to normal life was measured by three items (posttest): "Through vaccination, herd immunity can be achieved, which protects society against further waves"; "Vaccination enables the whole society to return to life as usual"; and "Vaccination makes it possible to end all measures and restrictions." Participants were asked to assess these items on a 7-point Likert scale ranging from 1 = *completely disagree* to 7 = *completely agree*. As the items were internally reliable, as indicated by the categorical omega ($\omega_c = .84$, $M = 4.50$, $SD = 1.80$)[4], a mean index was calculated.

5.4.5 Perceived norm of change

The perceived norm of change was operationalized as a perceived descriptive and injunctive norm of change among people who were vaccine hesitant. For the descriptive norm of change, the items were "Many of those who were formerly rather critical of Covid-19 vaccination are now willing to be vaccinated"; "A significant proportion of people who were formerly rather critical of Covid-19 vaccination are now tending to get vaccinated after all"; and "Among the majority of those who were previously rather critical of Covid-19 vaccination, vaccination willingness has changed." The three items covering the injunctive norm of change were "People who were formerly rather critical of Covid-19 vaccination now feel it is important for everyone to get vaccinated"; "People who were formerly more critical of Covid-19 vaccination find it important to reconsider their own attitudes"; and "People who were formerly more critical of Covid-19 vaccination find it okay to change their minds." Participants were asked (posttest) to assess

4 Following the debate by Sijtsma (2009), Revelle and Zinbarg (2009), and McNeish (2018), we used the categorical omega as defined by Green and Yang (2009) with bias-corrected bootstrapped confidence intervals. The calculation was done with the R Package MBESS (Kelley, 2020).

the extent to which the statements were correct, according to their opinion, on a 7-point Likert scale (1 = *not correct at all* to 7 = *fully correct*). Mean indices were calculated for the descriptive norm (ω_c = .93, *M* = 3.65, *SD* = 1.46) and injunctive norm of change (ω_c = .82, *M* = 3.28, *SD* = 1.50).

5.5 Data Analysis

To test H1, that exposure to a static or dynamic norm message will increase vaccination intention more than exposure to the control message, we conducted a one-way ANCOVA with the condition (static, dynamic, or control) as the independent variable, the posttest measurement of vaccination intention as the outcome, and the pretest measurement of intention as the covariate. H2 and H3 on possible mediators of the influence of dynamic norms on vaccination intention were tested by path analyses, with perceived future vaccination norm (H2) and perception of reaching the collective goal of getting back to normal life (H3) serving as mediators. Owing to the focus on the effect of dynamic norm messages in H2 and H3, the independent variable was binary, with 1 = *dynamic norm message* and 0 = *control message* (not including the static norm message).

H4 and H5 suggest specific effects and mechanisms for participants who were vaccine hesitant before message exposure. Based on the pretest measurement of vaccination intention on the 7-point Likert scale, the sample was divided into two groups: 1 = *vaccine-hesitant participants* (scale points 1 to 3 on the original intention scale, *n* = 781) and 0 = *vaccine-willing participants* (scale points 4 to 7 on the original intention scale, *n* = 1,508). To test H4 that vaccine-hesitant participants will be more likely to increase their intention to get vaccinated due to the dynamic norm message compared to vaccine-willing participants, the interaction between the binary group variable (i.e., 1 = *vaccine hesitant*, 0 = *vaccine willing*) and the condition was included in the ANCOVA (see H1). To test H5 on the mediating path of the dynamic norm influence via perceived descriptive and injunctive norms of change among vaccine-hesitant participants, a multigroup path analysis was used. This multigroup path analysis compared the paths of the dynamic norm message (vs. control message) for vaccine-hesitant and vaccine-willing participants.

6. Results

A comparison of vaccination intention (posttest) found almost no differences between the static norm (*M* = 4.63, *SD* = 2.35), dynamic norm (*M* = 4.49, *SD* = 2.37), and control (*M* = 4.39, *SD* = 2.34) messages. Controlling for the pretest measure of vaccination intention, the ANCOVA presented in Table 1 shows no significant differences across all three messages. Thus, hypothesis H1 on varying effects of the message is not supported.

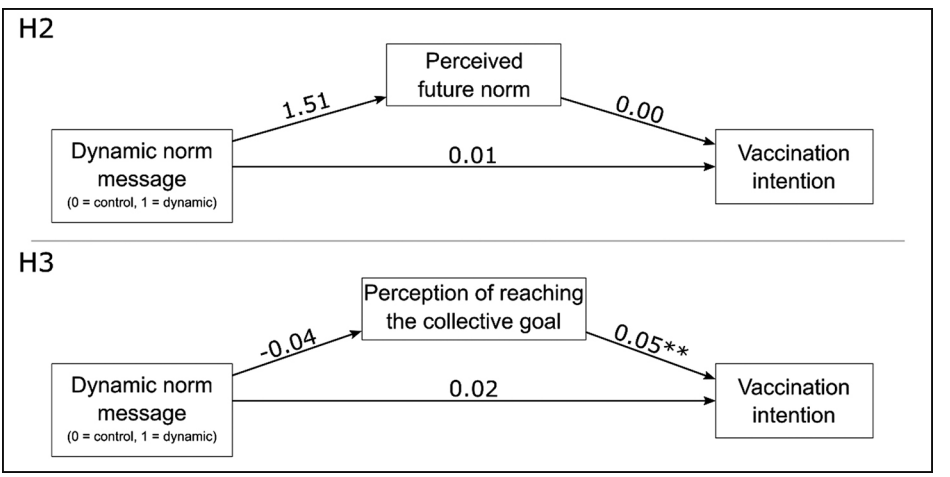
Table 1. Effect of norms messages on vaccination intention (H1)

	df	*F*	*p*	η_p^2	95% CI
Norms message: static norm, dynamic norm, control message	2	0.14	.871	0.00	[0.00, 0.00]
Pretest vaccination intention (covariate)	1	32861.23	.000	0.93	[0.90, 0.94]

Note. N = 2,289; the table shows the results of the one-way ANCOVA with vaccination intention at posttest as the outcome, the message condition as the independent variable, and pretest vaccination intention as the covariate.

Figure 2 presents the results of the mediation hypotheses, H2 and H3. The path model shows that the dynamic norm message did not significantly affect the perceived future norm and the future norm was not correlated with vaccination intention. Thus, there was no mediation effect of the dynamic norm message via the perceived future norm on vaccination intention (B = 0.00, p = .365, 95% CI [–0.00, 0.01]), meaning that H2 is not supported. In addition, the perception of reaching the collective goal of getting back to normal life did not significantly mediate the effect of the dynamic norm on vaccination intention (B = –0.00, p = .690, 95% CI [–0.01, 0.01]); therefore, H3 is rejected. The path model, however, shows a significant positive correlation between the perception of reaching the collective goal of getting back to normal life and vaccine intention. Thus, the perception of goal reachability was a significant (weak) correlate of vaccine intention, which was however not related to the dynamic norm message.

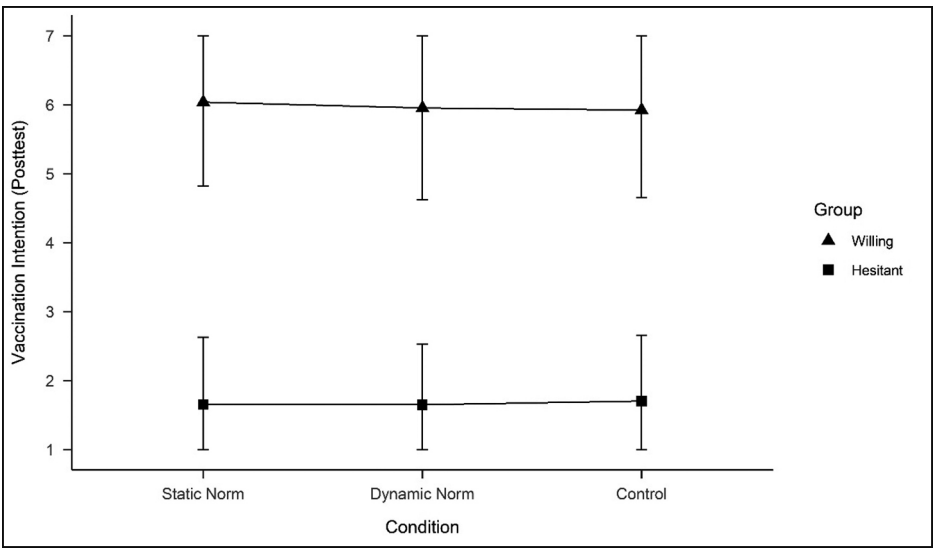
Figure 2. Mediation path models for the influence of the dynamic norm message on vaccination intention via perceived future norm (H2) and the perception of reaching the collective goal (H3)



Note. N = 2,289; the figure shows unstandardized estimates of the paths. The pretest measure of vaccination intention was included as a control variable in all models.
* p < .05, ** p < .01, *** p < .001

H4 stated that vaccine-hesitant participants would show a stronger reaction to the dynamic norm message than vaccine-willing participants. However, as shown in Figure 3, there was no significant interaction between both groups (i.e., vaccine hesitant, vaccine willing) and the message condition ($F(3, 2282) = 1.87$ $p = .133$, $\eta_p^2 = .00$). Thus, hypothesis H4 is not supported.

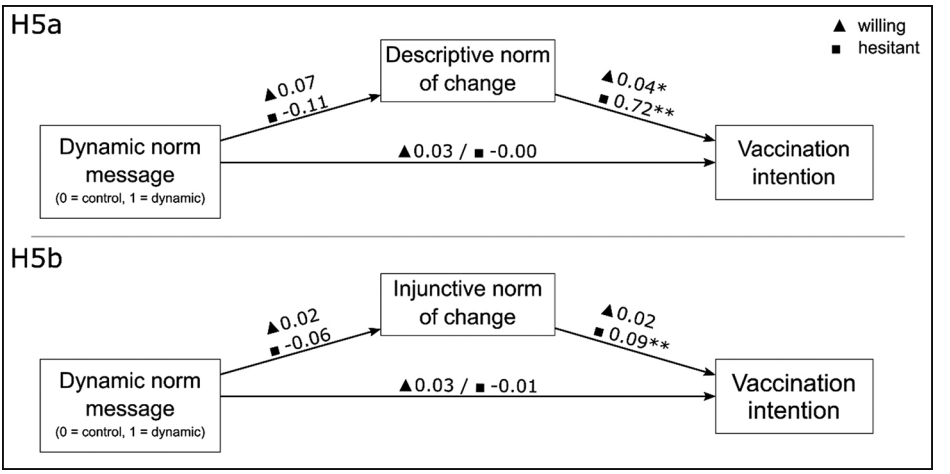
Figure 3. Effects of norms messages on vaccination intention for vaccine-hesitant vs. vaccine-willing people (H4)



Note. The figure shows the mean vaccination intention (at posttest) for participants who were *vaccine hesitant* (*n* = 781) vs. *vaccine willing* (*n* = 1,508).

H5 assumed that the effect of the dynamic norm message on the vaccination intention of vaccine-hesitant participants would be mediated by their perception of a norm of change. The path models presented in Figure 4 show that neither the descriptive norm (H5a; $B = -0.01$, $p = .402$, 95% CI [–0.03, 0.02]) nor the injunctive norm of change (H5b; $B = -0.01$, $p = .622$, 95% CI [–0.03, 0.01]) significantly mediated the effect of the norm messages on vaccine intention. Hence, the results do not support H5. However, a perceived norm of change in vaccination intention and in attitudes toward vaccination among people who were formerly rather critical about COVID-19 vaccination was correlated with a stronger intention to get vaccinated among vaccine-hesitant participants.

Figure 4. Mediation path models for the influence of the dynamic norm message on vaccination intention via perceived descriptive (H5a) and injunctive norms of change (H5b)



Note. The figure shows unstandardized estimates of the mediation paths, separately calculated for the vaccine-hesitant (■) and vaccine-willing (▲) groups. The pretest measure of vaccination intention was included as a control variable in all models.
* $p < .05$, ** $p < .01$, *** $p < .001$

7. Discussion

The study examined the influence of social norms messages on COVID-19 vaccination intention and extended the classic focus on static norms with the concept of dynamic norms (Sparkman & Walton, 2017). Using a preregistered experimental design, we found no effects of either static or dynamic descriptive norm messages on vaccination intention. This applies to people who were willing to get vaccinated and those who were hesitant, thus failing to support the idea that dynamic norm messages have a particular potential among vaccine-hesitant people. In the following, we will discuss these results as well as their theoretical and empirical implications.

7.1 Social norms and COVID-19 vaccination intention

Despite the theoretical potential of norms-based messages (Lewandowsky et al., 2021; Rimal & Storey, 2020) and the cumulative empirical evidence on their effects across various behaviors (Rhodes et al., 2020), our study did not reveal any normative effects on the intention to get vaccinated against COVID-19. This is in line with experimental studies on norms-based messages in the context of COVID-19 vaccination intention that also found only very weak to no effects (Moehring et al., 2021; Sinclair & Agerström, 2021). Comparably, a study only recently published (after our data collection) did not find effects of dynamic norm messages on intention to get the flu shot (Lee & Liu, 2021). There are three

explanations for the limited effects of social norms messages on the intention to get vaccinated against COVID-19.

First, the results indicate that normative influences regarding vaccination intention might be limited. The attribute-centered approach (Rimal et al., 2011) suggests that less visible behaviors are less subject to normative influences, as social sanctions are less likely. Although people can show themselves getting vaccinated on social media, and there is a trend of vaccine selfies (Bresge, 2021), it does not gain the everyday visibility of other preventive health behaviors, such as wearing a facemask. Lack of visibility might be one reason for the limited normative influences on vaccination intention. This explanation directly relates to practical implications, as it points to the idea of using the potential of social media and interpersonal communication to heighten the visibility of people getting vaccinated through a communication campaign (Geber & Hefner, 2019).

Second, it may be that another facet of norms that was not examined in the present study (and also in the above-mentioned experiments) is more relevant than expected in the context of vaccination willingness: injunctive norms. In contrast to descriptive norms, which refer to the prevalence of vaccination intention, injunctive norms convey information about the social approval of vaccination (Cialdini et al., 1990). Following this differentiation, people may perceive that getting vaccinated is less a cooperative behavior, which heavily depends on widespread willingness in the population (such as using contact-tracing technologies; Geber & Friemel, 2022), and more a morally driven behavior, which would make others' expectations and, thus, injunctive norms more important. In line with this interpretation, a recent meta-analysis by Rhodes et al. (2020) across various behaviors shows that "injunctive norms, though underutilized, may be more effective in changing behavior than previously considered" (p. 161). Directly related to this interpretation, it is also plausible that it is not the overall population that is the relevant reference group for vaccination intention but, rather, the direct social environment that can exert stronger normative pressure (Christensen et al., 2004; East et al., 2021; Patrick et al., 2012). Therefore, further research must assess the potential of injunctive and descriptive norms referring to different reference groups, such as the direct personal environment and the overall population (Geber et al., 2022). This was, however, not a viable option for the study at hand that aimed to inform the design of public communication campaigns addressing the general population.

The third explanation is methodological. The evidence on correlations between social norms and influenza vaccination uptake in surveys suggests that social norms generally can play a relevant role in vaccination intention and uptake (Bish et al., 2011; Schmid et al., 2017). Thus, the null effect might be due to the experimental design, particularly the single exposure to one message – though it has already been shown to be impactful in other contexts, such as sustainable behavior (Sparkman & Walton, 2017). Further exploratory analyses of our data showed that perceptions of descriptive norms are correlated with vaccination intention ($r = .30$, $p < .001$, 95% CI [.26, .34]), such that those who perceived a higher level of vaccination intention were more likely to intend to get vaccinated; but these perceptions, in turn, were not affected by the norms-based messages

($F(2, 2286) = 0.56$, $p = .57$, $\eta_p^2 = .00$). This explanation has some practical implications because it suggests that social norms campaigns need to be based on repeated exposure if they are to affect normative perceptions (Ratcliff et al., 2019). This might be particularly true in cases where normative messages are already salient in the media, which has been the case in Switzerland in the Spring/Summer 2021 with regard to vaccination norms in the population. The vaccination rate and its development were prominently discussed in the media, evidenced by headlines such as "50 percent of the Swiss are willing to be vaccinated" (Lüthy, 2021). This implies that participants of the experimental study might have had predefined perceptions about the vaccination norm in the population, making these cognitions less susceptible to normative information presented in a single-exposure design. In this regard, the present experimental design can be understood as a rather conservative test of norms message effects on COVID-19 vaccination intention.

7.2 Dynamic norms and COVID-19 vaccination intention

To expand the current state of research on normative influences on COVID-19 vaccination intention (e.g., Sinclair & Agerström, 2021), the present study integrated the idea of dynamic norms (Sparkman & Walton, 2017) to examine whether the information that the share of vaccine-willing people is steadily increasing has a particular potential in mobilizing vaccine-hesitant people to get vaccinated against COVID-19. Regarding vaccination intention, we did not find this mobilizing effect of dynamic norms compared to static norms. Interestingly, however, our results show that one part of this theoretical idea seems to hold true: Perceived norms of change were correlated with higher vaccination intention, especially among vaccine-hesitant participants. The more vaccine-hesitant participants perceived that people who were formerly critical about a vaccination were changing their minds, the greater their vaccination intention became. This finding suggests that communication strategies that aim to motivate people who are vaccine hesitant should convey the normative information that other vaccine hesitant people are changing their minds or that people similar to them are getting vaccinated. This is supported by theories of behavior change predicting that holding the identity of someone who gets vaccinated will predict motivation to be vaccinated (Epton et al., 2011).

7.3 Limitations

The present preregistered experiment was based on a heterogeneous sample concerning age, gender, and education. Further, it can be regarded as externally highly valid in terms of that the poster design was inspired by actual designs of the official health authority and the messages presented actual numbers of vaccination uptake and intention in Switzerland. However, there are methodological limitations that must be considered.

First, and most importantly, the treatment check indicated that participants did not recognize some key aspects of the norms-based messages. Besides the observa-

tion that participants who were exposed to a descriptive norm (in the form of the static or dynamic norm) did not perceive a higher descriptive norm than those who were exposed to the control message (see above), we note that participants who read the dynamic norm message were not more likely than those who read the control or static norm message to perceive an increase in the vaccination norm, Cramer's V (φc) = .02, 95% CI [.01, .02]. The reason for this might be that both the descriptive norm (i.e., the rate of vaccinated people) and the dynamic norm (i.e., increase in the rate of vaccinated people) were extensively reported in the media and, thus, might have been predefined salient cognitions. This argument points to the second limitation of our study: the one-time exposure to a single message. It seems that the one-dose message was not able to affect cognition, such as normative perceptions and intention. Future studies might test if a higher dosage of norms-based messaging is more effective (Ratcliff et al., 2019). Third, as the analysis employed a measure of intention instead of the vaccination behavior itself, the real impact of norms messages on vaccination might differ from our results. In an effort to close this gap, a behavioral measurement was included at the end of the survey, where participants were shown a button giving them the option of being forwarded to the website of their respective local vaccination authority. However, we also found no difference in this behavioral measurement across the three conditions (φc = .01, 95% CI [.00, .03]).

8. Conclusion

Social norms messages in general and dynamic norms messages in particular have been discussed as promising means of increasing vaccination intention in populations (Lewandowsky et al., 2021; Rimal & Storey, 2020). As dynamic norms increase the willingness to initiate personal change, they were expected to have a special effect among vaccine-hesitant people (Sparkman & Walton, 2019). Despite this theoretical potential, the present experimental study did not find norms-based effects on vaccination intention. Possible explanations for this are the limited visibility of getting vaccinated, a higher importance of other reference groups than the general population, and the broad coverage of vaccination rates in the media that might have limited the effect of a single-exposure design. To further inquire the potential of social norms messages, future research might examine (dynamic) injunctive norms messages, include different reference groups, such as the personal environment, and apply multiple-exposure designs.

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