The Role of Communication Style and External Motivators in Predicting Vaccination Experiences and Intentions: An Experimental Vignette Study

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Abstract

This vignette-based study examined in a sample of unvaccinated Belgian citizens (N = 1918; M_{age} = 45.99) how health care workers could foster reflection about and intentions to get vaccinated against COVID-19 by experimentally varying their communication style (i.e., autonomy-supportive vs. controlling) and the reference to external motivators (i.e., use of a monetary voucher or corona pass vs. the lack thereof). Each participant was randomly assigned to one of six conditions and rated a vignette in terms of anticipated autonomy satisfaction, perceived effectiveness, reflection, and vaccination intention. An autonomy-supportive, relative to a controlling, communication style predicted greater autonomy need satisfaction, which in turn related positively to perceived effectiveness, reflection, and vaccination intention. External motivators failed to generate positive effects compared to the control condition. The findings highlight the critical role of autonomy support in promoting a self-endorsed decision to get vaccinated.

Keywords: COVID-19, Self-Determination Theory, vaccine, health care workers, motivating communication style

Introduction

The question of how to motivate citizens who hesitate to get vaccinated or even experience resistance against vaccines is not only intriguing, but also of prime importance in the context of any pandemic. As vaccines against COVID-19 became widely available, countries across the world have adopted various strategies for implementing population-wide vaccination (Tinari & Riva, 2021). The World Health Organization called to invest in the training of general practitioners' motivating skills as they are trustworthy sources to address citizens' concerns and questions (e.g., World Health Organization, 2021). In addition, some governments introduced (monetary) vouchers to encourage people to get vaccinated (e.g., Serbia; Holt, 2021), while others implemented a vaccination pass that grants privileges (e.g., traveling, entering restaurants) to vaccinated persons, or a corona pass whereby, in addition to vaccination, a negative test or a recovery certificate are valid alternatives to obtaining these privileges (e.g., Italy, Lithuania, Poland; Reno et al., 2022; Walkowiak et al., 2021). These strategies were implemented on a societal scale such that certain subgroups in society could more rapidly regain and enjoy their removed freedoms.

Grounded in Self-Determination Theory (SDT; Ryan & Deci, 2017; Ryan et al., 2021), a well-known and validated social-psychological framework, the present experimental vignette-based study sought to examine the causal impact of these different motivating strategies. While the introduction of vouchers or a pass is a decision taken by politicians at a macro-level, the communication style of health care workers (HCWs) is situated at a micro-level. We examined the role of these manipulated variables on unvaccinated citizens' anticipated autonomy, reflection, and intention to get vaccinated.

Autonomy and Vaccination

Self-Determination Theory converges on the assumption that the support of individuals' autonomy is a key factor in fostering greater intentions to engage in

recommended health behaviors and in avoiding reactance or opposition. Within Self-Determination Theory, autonomy is defined as the experience of a sense of choice and psychological freedom in one's feeling, thinking, and acting (Ryan et al., 2021). Autonomy is conceived as a basic psychological need, the satisfaction of which is conducive to individuals' motivation, growth, and well-being (Vansteenkiste et al., 2020). As a case in point, autonomy need satisfaction, in conjunction with competence, relatedness, and security accounts for substantial variation in citizens' well-being during the COVID-19 crisis (e.g., Cantarero et al., 2021; ~~Dimmock et al., 2021;~~ Vermote et al., 2021). Moreover, the role of autonomy in fostering adherence to health-related recommendations has been established in various fields, including smoking cessation (Williams et al., 2006), diabetes management (Senécal et al., 2000), and healthy eating regulation (Verstuyf et al., 2016). In the context of the COVID-19 crisis, citizens' autonomous motivation to get vaccinated ~~concurrently~~ predicted ~~greater intentions to be vaccinated, while also relating to~~ greater vaccine uptake several months later (Schmitz et al., 2021).

In contrast, autonomy frustration involves the experience of pressure and conflict. As maintained within Self-Determination Theory, autonomy frustration comes with various costs, including ill-being and even psychopathology, especially when autonomy remains chronically thwarted (e.g., Chen et al., 2015). Moreover, when individuals' freedom is threatened or effectively removed, individuals are inclined to engage in the opposite behavior of what is demanded from them to restore their sense of freedom, a phenomenon known as psychological reactance (Pavey & Sparks, 2009; Van Petegem et al., 2015). Indeed, in the context of the COVID-19 crisis, autonomy frustration was found to relate to poorer mental health (e.g., ~~Levine et al., 2021;~~ Šakan et al., 2020) and ~~as well as~~ an unwillingness to get vaccinated (Porat et al., 2021). Moreover, citizens may feel obliged to suppress their doubts regarding the efficacy of the vaccine and to behaviorally comply with what is demanded from

"~~so-called~~ responsible citizens". Important indicators of defensiveness can then involve participants' refusal to reflect on the possibility to get vaccinated and the blunt opposition against the request to be vaccinated.

Autonomy-Supportive and Controlling Communication

Given the prominent role of autonomy in shaping people's behavior, a critical question is how citizens' sense of autonomy can be preserved and even supported while fostering vaccine uptake. One critical factor from the Self-Determination Theory-perspective concerns the style that one adopts when communicating ~~and interacting~~ with citizens. Indeed, addressing unvaccinated people can be done in a more autonomy-supportive or controlling manner (Teixeira et al., 2020). When autonomy-supportive, HCWs follow citizens' rhythm to come to an informed decision, ~~they~~ validate and accept their resistance, and ~~they~~ confirm a person's sense of choice in coming to a decision. At the same time, autonomy-supportive messages from HCWs offer relevant scientific-proven information and provide a solid rationale for why people may want to get vaccinated. They do so by attuning to individuals' concerns~~, doubts,~~ and questions. In contrast, controlling messages are used to convince, seduce, or force citizens to get vaccinated, often by bypassing citizens' perspectives and instead imposing one's own viewpoint. In doing so, HCWs can make use of a variety of controlling strategies, including guilt-induction, shaming, and the use of forceful language (~~Markland et al., 2005;~~ Vansteenkiste & Sheldon, 2006).

Dozens of studies in various health care domains have revealed that patients who perceive their HCW as more autonomy-supportive reported greater autonomy (Chen et al., 2018) and adhered better to health regulations (Williams et al., 2006). In a meta-analysis of these findings, Ng et al. (2012) showed that autonomy support predicted autonomy satisfaction within patients, which in turn related positively to autonomous self-regulation, and mental and physical health. Intervention research further shows that health care providers

can be successfully trained to adopt an autonomy-supportive style to the benefit of their patients (e.g., Gillison et al., 2019; Ntoumanis et al., 2021). In the context of COVID-19, research showed that if a message to stay at home was perceived as both autonomy-supportive and mandated, it predicted spending more time at home two months later.; On the contrary, perceiving those messages as controlling predicted spending less time at home (Legate & Weinstein, 2021). However, not all studies confirmed the beneficial role of autonomy support. For instance, one experimental study indicated that the provision of safety-related information as such (relative to the lack thereof) was the primary factor affecting people's intentions to use contact tracing technology, regardless of whether the messages were framed as autonomy-supportive or controlling (Bradshaw et al., 2021). Moreover, the results suggested that controlling conditions (versus autonomy-supportive conditions) resulted in higher intentions to download the contact tracing application. The authors explained their findings by indicating that people faced confusion and even mortal threat during the global pandemic. In such a potentially life-threatening context, a controlling style may no longer be perceived as illegitimate as the demanded behavior is essential, not optional, to maintain public health. The present study extended past work by examining the relevance of communication style in the context of vaccination. Although several studies highlighted the importance of a self-endorsed decision to get vaccinated (e.g., Fall et al., 2018; Schmitz et al., 2021), no experimental study so far examined the role of autonomy-supportive or controlling communication on vaccination behavior.

External Motivators

Apart from differences in the communication style of HCWs (i.e., a factor situated at the micro-level), externally motivating tools that are introduced at a political or macro-level may also influence citizens' decision to get vaccinated. One of the premises of Self-Determination Theory is that external motivators have the potential to either facilitate or

undermine individuals' intrinsic motivation (Ryan & Deci, 2000). However, this assumption may be less relevant in the present context because, admittedly, getting vaccinated is not an intrinsically motivating activity for those who are doubtful or resist the vaccine, quite the contrary. Therefore, it is less of a concern that external motivators would impact intrinsic motivation. However, vaccination does not need to be intrinsically motivating as it is mainly important that citizens fully identify with the importance of vaccination, which translates into more long-term persistence (Schmitz et al., 2021). But even then, there is some evidence that external motivators can forestall the full endorsement of internalization of a non-interesting activity (Reeve et al., 2002). Although from a cost-benefit perspective, external motivators may be seen as a useful tool to promote short-term compliance with vaccination regulations, for the behavior to persist in the long term, people must internalize the reason for getting vaccinated. Therefore, it is rather short-sighted to appraise such externally enforced behavioral compliance exclusively as a benefit, since it remains uncertain how many booster injections citizens would be needed in the long run to preserve satisfactory immunity levels. For this reason, it is critical to examine whether external motivators may not just foster greater behavioral intentions as such, but also undermine process-related factors, including participants' felt autonomy and deeper reflection, critical experiences that may predict long-term adherence to vaccination.

To account for the variable impact of external motivators, it is critical to shed light on their attributed meaning or *functional significance* (Deci & Ryan, 1985). On the one hand, external motivators can carry high informational value if they contain appropriate information that allows individuals to make more informed decisions. For instance, in the case of a pandemic, external motivators may inform citizens about the severity of the situation or the desirability of certain precautionary behaviors. On the other hand, external motivators can acquire a controlling and pressuring meaning when appraised as a strategy to

seduce, force, or manipulate people into vaccination. As far as external motivators carry low informational and high controlling value, they are presumed to backfire, thereby eliciting reactance because they compromise the satisfaction of autonomy. But, if external motivators carry high informational and low controlling value, they are expected to be perceived as more legitimate means to motivate citizens (Deci et al., 1999; ~~Landry et al., 2019;~~ Landry et al., 2022).

These considerations are important when developing nuanced hypotheses concerning the motivational impact of vouchers and a corona pass, i.e., the two external motivators that were manipulated in the present experiment. In the case of a corona pass, the informational value may be higher because the pass is intended to give people an indication of whether a person is COVID-"safe" or not. Moreover, the fact that a negative PCR test or a recovery certificate from a recent infection serve as equivalent alternatives to vaccination lowers its controlling value. A monetary voucher, in contrast, carries a more controlling and low informational meaning because only vaccinated people are entitled to it and the cash reward itself does not contribute to fighting the pandemic.

However, previous research efforts report conflicting findings on the use of these external motivators that were introduced on a macro level. A large-scale national cross-sectional survey in the UK concluded that the introduction of a vaccine passport (i.e., only people who are vaccinated get access to public spaces) would lower the inclination to accept a COVID-19 vaccine (de Figueiredo et al., 2021), whereas research on a corona pass (i.e., in which a negative test result or proof of recovery serve as valid alternatives of vaccination) sends a more nuanced message. For instance, a cross-sectional survey in Israel found that 31% of the people who had no intention to get vaccinated declared that the offer of a corona pass (i.e., the so-called "green pass") would possibly or definitely convince them, while 46% said it would not (Saban et al., 2021). Next, a study using a synthetic control model

comparing six countries showed that a corona pass led to increased vaccination numbers 20 days before implementation, with a lasting effect up to 40 days after. However, no effect was found in countries that already had average uptake (Mills & Rüttenauer, 2022). Also regarding the introduction of a voucher, previous research reported mixed findings. For instance, whereas an experimental vignette study reported evidence that monetary payments failed to increase people's willingness to get vaccinated against COVID-19 (Sprengholz et al., 2021), two experimental studies found that payments increased vaccination rates (Campos-Mercade et al., 2021; Duch et al., 2021). However, these researchers discuss their findings by alluding to fears that "monetary incentives could potentially crowd out the willingness to get vaccinated in the future (e.g., booster shots) without getting paid" (Campos-Mercade et al., 2021).

The paucity of past work on the impact of external motivators on vaccination intention suffers from two notable limitations. First, no prior study included process variables that could predict long-term vaccination intentions, such as felt autonomy or elicited reflection about vaccination. Second, none of these studies examined whether the effectiveness of these external motivators depends on people's initial willingness to be vaccinated. This is all the more striking because research on incentives showed that incentives, regardless of their type, are much less effective for those who initially refused the COVID-19 vaccine than for those who are hesitant (Salali & Uysal, 2021).

In light of these considerations, we reasoned that especially citizens refusing the vaccine would perceive the use of vouchers as a controlling means to seduce, if not, manipulate them into vaccination, with resulting negative consequences on their felt autonomy and intention to get vaccinated. This specific motivational pitfall may be less readily evident in the case of the corona pass because unwilling participants can turn to other options than vaccination, namely, a negative PCR test or a recovery certificate from a recent

infection. Therefore, the corona pass is likely to be seen as a less pressuring tool that aims to seduce people into vaccination.

The Present Study

The present study sought to examine the impact of different motivating strategies on citizens' anticipated autonomy, reflection, and intention to get vaccinated among hesitant and refusing, unvaccinated people. We formulated three objectives that materialize, respectively, in main effects, interactions, and mediational processes.

First, as for the main effects, we built on Self-Determination Theory to hypothesize that an autonomy-supportive, relative to a controlling, style would yield various benefits, including greater perceived effectiveness, enhanced autonomy, reflection, and intention to get vaccinated (Hypothesis 1a). Autonomy-supportive communication would yield such benefits because HCWs adopt a more process-oriented focus in this case, thereby trying to align with the person's perspective. In addition, we predicted that monetary vouchers would have a more negative impact compared to a control group, thereby forestalling the perceived effectiveness, autonomy, reflection, and vaccination intentions (Hypothesis 1b). We did not hypothesize such negative effects for the corona pass because both a negative PCR test and a previous infection served as equivalents for vaccination, thereby increasing the informational value and taking away the pressure to get vaccinated (Objective 1).

Second, we expected some interaction effects between the style of communication and the use of external motivators. More specifically, we hypothesized that the use of a voucher would be especially detrimental when communicated in a controlling manner, because the pressuring meaning of vouchers would become more readily evident when a HCW is instrumentally putting pressure on the outcome of vaccination (Hypothesis 2a). Moreover, we sought to examine the generalizability of the main effects across participants varying in their readiness for vaccination. Specifically, we hypothesized that both a

controlling (versus an autonomy-supportive) approach, as well as the introduction of vouchers (versus a corona pass or control condition), should especially backfire among refusing people, who may more easily feel cornered and not understood in their arguments to reject vaccination (Hypothesis 2b) (Objective 2).

Finally, in a series of mediational models, we sought to examine whether autonomy satisfaction could serve as an intermediate mechanism explaining why autonomy-supportive communication and the use of vouchers predict perceived effectiveness, reflection, and vaccination intentions ~~in a positive and negative wa~~positively and negatively, respectively (Hypothesis 3; Objective 3).

Method

Procedure and Participants

On December 28, 2020, the first person in Belgium received a vaccine against COVID-19. In June 2021 – the moment during which we conducted the present study - the vaccination campaign was rolled out at a large scale in the Belgian population. After providing the opportunity to be vaccinated to health professionals, the elderly, and vulnerable persons with comorbidities, everyone under 65 years of age was gradually invited (from old to young) to receive a vaccine.

We recruited participants by using a paid advertising campaign on Facebook. The survey was available in Dutch and French. After giving their informed consent online, 15466 citizens (M_{age} = 51.65 years, *SD* = 15.36; 61.3% female; 70.9% Dutch and 29.1% French speakers) completed the survey. For the purpose of the current study, we selected the unvaccinated participants 1918 citizens (M_{age} = 45.99 years, *SD* = 13.26; 56.4% female; 56.7% Dutch) who indicated that they refused (81.1%) or were hesitant (18.9%) to get vaccinated. The participants who indicated that they were already vaccinated or would accept the vaccine once they received an invitation were excluded from the analyses. From the final

sample, a majority of 71.2% reported having a partner, 36% obtained at most a secondary education degree, while 38.8% had a bachelor's degree and 25.2% had a master's degree. A minority of participants (10.6%) suffered from one (8.6%) or more (2%) chronic diseases, making them more vulnerable to the consequences of COVID-19.

After the collection of these sociodemographic characteristics, we invited participants to imagine themselves having a hypothetical conversation with a HCW. We asked the participants to project themselves into the situation (see Supplementary Material Table 1S). Each participant was randomly allocated to one of six conditions formed by crossing the communication style of the HCW (i.e., autonomy-supportive vs. controlling) with external motivators (i.e., a monetary voucher vs. a corona pass vs. control group). Next to these two between-participants factors, we also took into account participants' vaccination readiness levels (i.e., hesitating vs. refusing). This resulted in a 2 × 3 × 2 factorial design with two levels for communication style (autonomy-supportive vs. controlling), three types of external motivators (voucher vs. corona pass vs. control condition), and two levels of vaccination readiness (hesitating vs. refusing). After reading the vignette, participants had to rate the effectiveness of the approach of the HCW, their anticipated autonomy, intention to reflect upon the issue, and intention to get vaccinated. The procedure was approved by the ethical committee of ~~[blinded~~Ghent~~]~~ University (reference number 2020/174).

Outcome Measures

Unless otherwise indicated, all items were rated on a Likert-type scale ranging from 1 *definitely not* to 5 *definitely*.

Manipulation check. Following the stem "After this conversation with the health professional, I would...", one item tapped into participants' perception of an autonomy-supportive ("...feel that the HCW is trying to understand how I view the issue of vaccination*"*) and controlling ("...feel that the HCW is pressuring me to get vaccinated*"*)

communication style. ~~All items were rated on a Likert-type scale ranging from 1 *definitely not* to 5 *definitely*.~~

Perceived effectiveness. Participants rated the item "How effective would this approach be in getting you vaccinated" on a 5-point scale ranging from 1 *definitely not effective* to 5 *definitely effective*.

Felt autonomy. Following the stem "After this conversation with the health professional, I would...", items tapped into participants' expected feelings of autonomy satisfaction ("… experience a sense of choice and freedom" and "...have the feeling of being able to do what I really want to do") and autonomy frustration ("…feel obligated to do certain things" and "…feel like people are forcing me to do certain things"). These four items were based on The Basic Psychological Need Satisfaction and Frustration Scale (Chen et al., 2015), a validated and widely used scale to measure psychological need experiences at the trait and state level (Van Petegem et al., 2015). ~~All items were rated on a Likert-type scale ranging from 1 *definitely not* to 5 *definitely*.~~ Because autonomy need satisfaction and frustration were strongly negatively correlated (r = -.49, $p \leq .01$), a composite measure was created by averaging the need satisfaction items with the reversed scored need frustration items, as done in previous research (De Muynck et al., 2021). The internal consistency of this 4-item scale was acceptable ($\alpha = .75$).

Reflection. Following the stem "After this conversation with the health professional, I would...", one item tapped into participants' intention to reflect on vaccination (i.e., "…think carefully about vaccination"). ~~on a Likert-type scale ranging from 1 *definitely not* to 5 *definitely*.~~

Vaccination intention. Finally, participants rated the item "Taking into account the information you received from the health professional, how do you think you would react if given the opportunity to be vaccinated?" on a scale ranging from 1 *refuse without hesitation*

to 5 *accept without hesitation* (~~see~~ Schmitz et al., 2021).

Plan of Analysis

We performed all statistical analyses using RStudio version 2022.02.3 (RStudio, 2022). Because of the large sample size, we only considered the results with an effect size of $\eta^2_p \geq .01$ as meaningful (Cohen, 1988).

Before proceeding to the main analyses, we performed a Pearson correlation analysis among all study variables, as well as a multivariate analysis of variance (MANOVA) with Tukey post hoc tests to check the success of our manipulation of the HCW's communication style.

To examine research Objectives 1 and 2, we conducted a MANOVA with the two manipulated variables (i.e., communication style, external motivators), vaccination readiness, and their interaction terms as independent variables, and perceived effectiveness, autonomy satisfaction, reflection, and vaccination intention as dependent variables. Next, we performed four univariate ANOVAs to examine the main and interaction effects on each separate outcome. We probed meaningful main and interaction effects with regression analyses which used the specific outcome as our criterion and four contrast-coded variables (autonomy-supportive vs. controlling style; voucher vs. corona pass and control group; corona pass vs. control group; hesitating vs. refusing) along with their interactions as simultaneous predictors.

To pursue Objective 3, we tested a path model with bootstrapping results to examine whether autonomy satisfaction could serve as a mediating variable between HCW's communication style (one contrast: autonomy-supportive vs. controlling style), the external motivators (two contrasts: voucher vs. corona pass and control group; corona pass vs. control group), and their two interaction effects on the one hand, and perceived effectiveness, reflection, and vaccination intention on the other. Because the effect sizes of the two-way

interaction effects between vaccination readiness and (a) the HCW's communication style and (b) external motivators, as well as the three-way interaction between these variables were small ($\eta^2_p \leq .01$), we decided not to include them as additional predictors in this path model. An acceptable model fit was indicated by a χ^2 /df ratio of 2 or below, CFI values of .90 or above, and SRMR and RMSEA values of .08 or below (Hu & Bentler, 1999).[1]

Results

Preliminary Analyses

Table 1 shows the means for all dependent variables and their intercorrelations. All vaccination-related outcomes were significantly positively related.[2]

[Table 1 near here]

~~Figure 1 shows box plots to facilitate the understanding of the descriptive statistics and to provide a way of visually representing the distribution of the continuous outcomes. We can notice that the combination of an autonomy-supportive style with a corona pass or control condition resulted in the highest scores on perceived effectiveness. Second, with regard to autonomy satisfaction, an autonomy-supportive style is crucial, regardless of the type of the induced external motivator. Third, in terms of anticipated reflection, the least desirable combination is when a monetary voucher is introduced in a controlling way by a HCW. Finally, there appear to be no differences between the conditions in terms of vaccination intention.~~

~~[Figure 1 near here]~~

[1] In a set of supplementary analyses, we repeated these analyses on the whole dataset (including the vaccinated participants and the participants who indicated that they would accept vaccination once they receive an invitation) to more fully explore the effect of vaccination readiness. The same conclusions can be drawn as from the analyses on the subsample of hesitating and refusing citizens as reported in the main study (see Appendix A in Supplementary Material).

[2] Figure 1S in Supplementary Material shows box plots to facilitate the understanding of the descriptive statistics and to provide a way of visually representing the distribution of the continuous outcomes.

A MANOVA confirmed that the manipulation of the HCW's communication style was successful, Wilks's $\lambda = .91$; $F(1, 1844) = 89.41$, $p \leq .001$, $\eta^2_p = .09$. Participants rated the HCW as more autonomy-supportive when having read an autonomy-supportive vignette ($M = 2.75$, $SD = 1.31$) relative to a controlling vignette ($M = 2.17$, $SD = 1.27$) ($F(1, 1844) = 93.57$, $p \leq .001$, $\eta^2_p = .05$). Conversely, participants rated the HCW as more controlling when they had read a controlling ($M = 4.51$, $SD = .83$) relative to an autonomy-supportive vignette ($M = 3.96$, $SD = 1.17$) ($F(1, 1844) = 136.11$, $p \leq .001$, $\eta^2_p = .07$).

Research Objective 1: Main Effects

~~Figure 2 provides the means for all outcomes in each of the six experimental conditions.~~ Our MANOVA showed significant main effects for the communication style (Wilks's $\lambda = .94$; $F(1,1816) = 29.38$, $p \leq .001$), external motivators (Wilks's $\lambda = .99$; $F(2, 3634) = 2.63$, $p \leq .01$), and vaccination readiness (Wilks's $\lambda = .54$; $F(1, 1819) = 392.32$, $p \leq .001$), with these main effects having meaningful effect sizes for communication style ($\eta^2_p = .06$) and vaccination readiness ($\eta^2_p = .46$), but not for external motivators ($\eta^2_p = .00$).[3]

Further, all two-way multivariate interaction effects were significant but had negligible effect sizes, namely between communication style and external motivators (Wilks's $\lambda = .99$; $F(2, 3634) = 2.96$, $p \leq .01$, $\eta^2_p = .00$), between vaccination readiness and communication style (Wilks's $\lambda = .99$; $F(1, 1816) = 3.08$, $p \leq .05$, $\eta^2_p = .00$), and between vaccination readiness and external motivators (Wilks's $\lambda = .98$; $F(2, 3634) = 3.59$, $p \leq .001$, $\eta^2_p = .00$). The three-way interaction effect was not significant (Wilks's $\lambda = .99$; $F(2, 3634) = 1.57$, $p = .129$, $\eta^2_p = .00$).

~~[Figure 2 near here]~~

Follow-up univariate ANOVAs revealed, first, a significant effect of communication

[3] Figure 2S in Supplementary Material provides the means for all outcomes in each of the six experimental conditions.

style on perceived effectiveness, autonomy satisfaction, and reflection. However, only the main effects for perceived effectiveness and autonomy satisfaction had meaningful effect sizes ($\eta^2_p \geq .01$; see Table 2). Considering these meaningful main effects, contrast analyses indicated that, compared to a controlling style, an autonomy-supportive communication style came across as more effective ($\beta = .12$, $p \leq .001$) and fostered more autonomy need satisfaction ($\beta = .23$, $p \leq .001$) (Hypothesis 1a).

[Table 2 near here]

Thirdly, with respect to vaccination readiness, the univariate ANOVAs revealed a significant and meaningful effect of vaccination readiness on each outcome ($p < .001$; $\eta^2_p \geq .01$), except on autonomy satisfaction (see Table 3). Indeed, the follow-up contrast analyses showed that people who are hesitant judged a conversation with a HCW to be more effective ($\beta = .30$, $p \leq .001$) and more beneficial to stimulate reflection ($\beta = .46$, $p \leq .001$) and vaccination intentions ($\beta = .67$, $p \leq .001$) than people who indicated to be inclined to refuse vaccination did, but not more autonomy-satisfying ($\beta = .02$, $p = .346$) (see Table 3).[1]

[Table 3 near here]

Research Objective 2: Interaction Effects

Turning to the interactions between the adopted communication style and external motivators, only the interaction term of the univariate ANOVAs for reflection proved significant and meaningful ($p < .001$, $\eta^2_p \geq .01$) (see Table 2). However, the fine-grained contrast analyses indicated that none of the two possible interactions (i.e., as there were two contrasts for external motivators included in the regression analyses) were significant (Hypothesis 2a).

Regarding the interaction with vaccination readiness, the interaction terms for perceived effectiveness (interaction with communication style and with external motivators) and autonomy satisfaction (interaction with communication style) were significant. However,

all effect sizes were negligible (Hypothesis 2b, see Table 2).[2]

Research Objective 3: Mediation

Finally, we performed a path model with autonomy satisfaction as a mediating variable in the relation between communication style (one contrast), the external motivators (two contrasts), and their two interaction effects on the one hand, and perceived effectiveness, reflection, and vaccination intention on the other. The model was saturated (*CFI* = 1.00; *RMSEA = .00, SRMR = .00).* Results showed that autonomy satisfaction served as an explanatory variable between HCW's communication style (i.e., controlling versus autonomy-supportive) on the one hand and perceived effectiveness (indirect effect β = .06, $p \leq .001$), reflection (indirect effect β = .03, $p \leq .001$), and vaccination intention (indirect effect β = .03, $p \leq .001$) on the other hand. As an example, with regard to the first indirect effect mentioned above, the path from an autonomy-supportive style to autonomy satisfaction (β = .24) combined with the path from autonomy satisfaction to perceived effectiveness (β = .24) resulted in a reduction of the total effect of an autonomy-supportive style on reflection of β = .11 to a direct effect of β = .05.

Autonomy satisfaction did not mediate the relation between the (interaction between communication style and) external motivators on the one hand, and perceived effectiveness, reflection, and vaccination intention on the other. Figure ~~3~~1 provides a visual representation of the path model (Hypothesis 3).

[Figure ~~3~~1 near here]

Discussion

~~Although a substantial percentage of Belgian citizens expressed their intention to accept a vaccine against COVID-19 at the outset of the vaccination campaign, others were doubtful and displayed vaccination hesitancy.~~ We conducted the current vignette-based study to investigate how hesitant and refusing individuals could best be approached during the

COVID-19 vaccination campaign. Specifically, the study sought to examine whether the communication style of HCWs would matter in terms of individuals' experiences and intentions regarding vaccination. Because governmental policies may influence individuals' experiences and intentions with respect to vaccination at a broader level, we additionally examined the use of a monetary voucher or a corona pass as a motivational strategy. In doing so, we took into account citizens' initial willingness to accept the vaccine. ~~because previous research has shown that some strategies are less effective among vaccine-refusing citizens (Salali & Uysal, 2021).~~ We varied the nature of the dependent variables that we studied, with some of these variables being more process-oriented (i.e., felt autonomy, reflection) and others being more outcome-based (i.e., perceived effectiveness, vaccination intention).

Role of Communication Style and External Motivators

Clearly, the style used by HCW matters in the prediction of different outcomes. Specifically, participants perceived an autonomy-supportive interaction style as more effective than a controlling style. Moreover, our process analysis indicated that an autonomy-supportive, relative to a controlling, communication style predicted greater autonomy need satisfaction, which in turn related positively to perceived effectiveness, reflection, and vaccination intention. The current findings are consistent with previous research showing the importance of autonomy need satisfaction in the health context (e.g., Williams et al., 2006), but also more specifically during the COVID-19 crisis (e.g., Cantarero et al., 2021). Therefore, health workers are best advised to use an autonomy-supporting conversational style, meaning that they empathetically take the perspective of the citizen, provide meaningful explanations about the importance of vaccination, and offer a genuine choice to be vaccinated or not. However, we would like to warn against an instrumental approach of autonomy support by which autonomy satisfaction is treated as an instrumental pathway that helps in reaching desired ends (i.e., vaccination). Rather, it is important to consider autonomy

as a fundamental basic psychological need with its support representing a valuable outcome in itself, regardless of whether it instrumentally entails other benefits (Vansteenkiste et al., 2012). At the same time, HCWs should definitely refrain from a controlling style in which they exert pressure on citizens through guilt induction, by reminding them of their duty as citizens, or by suppressing or minimizing their concerns.

An autonomy-supportive communication style did not directly contribute to higher vaccination intention, but did so only indirectly through increased autonomy satisfaction. Particularly among hesitant or refusing people, the goal of convincing them to vaccinate by means of a conversation with a HCW is probably unrealistic. However, supporting their need for autonomy may be a desirable outcome in its own right, regardless of whether it has the potential to translate into long-term benefits.

Next to a HCW's communication style, we also considered the use of a monetary voucher and a corona pass as two macro-level strategies that may yield a supplementary impact. Interestingly, we found no meaningful difference between the introduction of a corona pass, a monetary reward, and/or the control group. However, the results cautiously point out that participants perceived vouchers as the least effective strategy. This is in line with the assumption of Self-Determination Theory that the detrimental effect of an external motivator may depend on its functional significance (Ryan & Deci, 2017). Whereas monetary vouchers carry high controlling and low informational value because only vaccinated people are entitled to them and the cash reward itself does not contribute to fighting the pandemic; a corona pass carries high informational and low controlling value because it is intended to give people an indication of whether a person or situation is "safe" and because citizens can choose from several options (e.g., vaccination, negative PCR test, or a recovery certificate).

Role of Vaccination Readiness

An innovative feature of the present study involved examining whether individuals

with a different vaccination readiness would appraise the vignettes differently. In supplemental analyses (see Appendix A) ~~(see Footnote 1)~~, we explored this effect even more thoroughly. Results showed that the more convinced participants were of vaccination themselves, the more they estimate that they or someone else can be convinced to get vaccinated. People who were inclined to accept vaccination rated a conversation with a HCW as more positive overall compared to people who indicated to be hesitant or were inclined to refuse vaccination. In doing so, they may be overestimating the motivational potential of these strategies, presumably because they have a more intuitive viewpoint on what is (de)motivating. These findings call into question a popular idea that individuals who are in favor of vaccination know how to motivate others who are not convinced of vaccination. This is a key message because, in many countries, the policy choices to encourage people to get vaccinated are made by a government and experts who are in favor of vaccination. This study emphasizes the importance of listening to doubtful or opposed individuals in their opinions about vaccination. In particular, the present findings question the ability of persons who are convinced of vaccination to motivate the hesitating or refusing individuals.

Limitations

Although our experimental design included relevant factors at both macro and micro levels as predictors of the vaccine-related process- and result-based outcomes, thereby taking into account an individual's vaccination readiness, the present study also has some limitations.

First, to limit the completion time of the survey, we chose to assess participants' effectiveness, reflection, and vaccination intention with a single item. Although previous research indicates that single items are acceptable when constructs are unidimensional and clearly defined (e.g., Allen et al., 2022~~; Fuchs & Diamantopoulos, 2009~~), a limitation of the current study is that we did not select our items based on previous studies (e.g., see Dillard et

al. (2007) for a single item on effectiveness).

Second, the likelihood of finding statistically significant results was substantial because of the large sample size. For this reason, we only considered the results with a $\eta^2_p \geq .01$ as meaningful (Cohen, 1988). The small effect sizes remind us that these effects play a smaller role than one would think. At the same time, previous research suggests that such small effects can accumulate to yield large impacts at national or global levels (Götz et al., 2022). For instance, a communication style that has a small but significant influence on the degree to which a person intends to get vaccinated may be far from trivial when conveyed to millions of people (Funder & Ozer, 2019).

Also, the artificial conversation may have compromised the emergence of large effect sizes because vignettes are less engaging than « actual » conversations. For instance, we found, in line with Sprengholz and colleagues' (2021) vignette study, no effect of monetary rewards, while experimental studies that measured actual behavior did find an effect (Campos-Mercade et al., 2021; Duch et al., 2021). However, the period in which we conducted this study (i.e., when the vaccination campaign was in full force) probably boosted realism. We thus think that participants had little difficulty imagining themselves or others in the fictional conversations, allowing them to convey truthful responses. It remains that we asked participants to project themselves in the situation and report their *anticipated* feelings or *intended* behavior, which does not necessarily mean that they would actually feel or do what they indicated. Indeed, studies concerning vaccines against the Human papillomavirus showed that only 38% of people who expressed their intention to get vaccinated followed through and initiated vaccination (e.g., Brewer et al., 2011). Results as these call for some level of caution when considering the message that emerges from current efforts.

Conclusion

Identifying the most motivating strategy is key for the development of an effective

vaccination campaign in both the short and long run. An autonomy-supportive, relative to a controlling communication style, came across as more effective, due to improved autonomy satisfaction. Our results showed that external motivators are not effective and do not enhance reflection, autonomy satisfaction, or vaccination intention. These findings highlight the critical role of autonomy support in promoting self-endorsed decisions to get vaccinated.

Conflicts of Interest

The authors report there are no competing interests to declare.

Data availability statement

All de-identified data and analysis code are available at https://doi.org/10.5281/zenodo.6323246 ~~[link blinded]~~.

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Footnotes

[1]In a set of supplementary analyses, we repeated these analyses on the whole dataset (including the vaccinated participants and the participants who indicated that they would accept vaccination once they receive an invitation) to more fully explore the effect of vaccination readiness. We conducted four regression analyses which used the four outcomes as our criterion and six contrast-coded variables (autonomy-supportive vs. controlling style; voucher vs. corona pass and control group; corona pass vs. control group; vaccinated and accepting vs. hesitating and refusing participants; vaccinated participants vs. participants who indicate they would accept; and hesitating vs. refusing participants) along with their interactions as simultaneous predictors.

The same conclusions can be drawn as from the analyses on the subsample of hesitating and refusing citizens as reported in the main study. Specifically, compared to a controlling style, an autonomy-supportive communication style came across as more effective ($\beta = .12$, $p \leq .001$) and fostered autonomy need satisfaction ($\beta = .35$, $p \leq .001$). Secondly, external motivators yielded no meaningful effects. Thirdly, with respect to vaccination readiness, people who are vaccinated or who are inclined to accept vaccination judged a conversation with a HCW to be more effective ($\beta = .35$, $p < .001$), and more beneficial to stimulate reflection ($\beta = .35$, $p < .001$) and vaccination intentions ($\beta = .41$, $p < .001$) than people who indicated to be hesitant or inclined to refuse vaccination. In addition, convinced citizens also evaluated the conversation as more autonomy-satisfying ($\beta = .21$, $p < .001$). No interaction effects were meaningful.

Table 1

Means, Standard Deviations, and Intercorrelations among the Outcome Variables

	M	*SD*	*1*	*2*	*3*
1. Perceived effectiveness	1.73	.90			
2. Autonomy satisfaction	2.36	.99	.25**		
3. Reflection	2.09	1.21	.45**	.13**	
4. Vaccination intention	1.64	.87	.50**	.13**	.61**

Note. *M* and *SD* represent mean and standard deviation, respectively.

Note. All items were scored on a 5-point Likert scale.

** $p \leq .01$

Table 2

Means and Standard Deviations, together with the Univariate Main and Interaction Effects of the External Motivators, resulting from the ANOVAs

	Communication style			**External motivators**				
	Autonomy-supportive style	**Controlling style**	**Main effect style**	**Voucher**	**Corona pass**	**Control condition**	**Main effect external motivators**	**Interaction effect**
	M (*SD*)	*M* (*SD*)	*F* (1, 1834) / η^2_p	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*F* (2, 1834) / η^2_p	*F* (2, 1834) / η^2_p
Perceived effectiveness	1.82 (.93)	1.63 (.87)	22.73^{***}/ .01	1.62_a (.85)	1.74_b (.88)	1.81_b (.96)	8.40^{***} / .00	.17 / .00
Autonomy satisfaction	2.59 (1.02)	2.13 (.91)	105.24^{***} / .05	2.33 (.98)	2.39 (1.01)	2.37 (.99)	.64 / .00	.67 / .00
Reflection	2.16 (1.23)	2.02 (1.19)	7.42^{**} / .00	2.06 (1.22)	2.12 (1.21)	2.09 (1.21)	.41 / .00	10.81^{***} / .01
Vaccination intention	1.66 (.87)	1.63 (.87)	1.39 / .00	1.58_a (.84)	1.66_{ab} (.86)	1.69_b (.91)	4.42^{*} / .00	2.96 / .00

Note. *M* and *SD* represent mean and standard deviation, respectively.

Note. A distinct subscript means that groups significantly differ from each other.

Note. The effect sizes (calculated as the partial eta squared) were small for all outcomes, except for a medium effect size for autonomy satisfaction when differing an autonomy-supportive with a controlling communication style (Cohen, 1988).

$^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

Table 3

Means and Standard Deviations, together with the Univariate Main and Interaction Effects of Vaccination Readiness, resulting from the ANOVAs

	Hesitating	**Refusing**	**Main effect of vaccination readiness**	**Interaction effect with style**	**Interaction effect with external motivators**
	M (*SD*)	*M* (*SD*)	*F* (1, 1834) / η^2_p	*F* (1, 1834) / η^2_p	*F* (2, 1834) / η^2_p
Perceived effectiveness	2.27 (.93)	1.60 (.85)	175.81^{***} / .09	5.70^{*} / .00	6.04^{**} / .00
Autonomy satisfaction	2.39 (1.00)	2.36 (.99)	.77 / .00	8.20^{**} / .00	1.12 / .00
Reflection	3.25 (.98)	1.82 (1.10)	498.42^{***} / .21	.00 / .00	.39 / .00
Vaccination intention	2.86 (.60)	1.37 (.66)	1504.63^{***} / .45	.15 / .00	3.00 / .00

Note. *M* and *SD* represent mean and standard deviation, respectively.

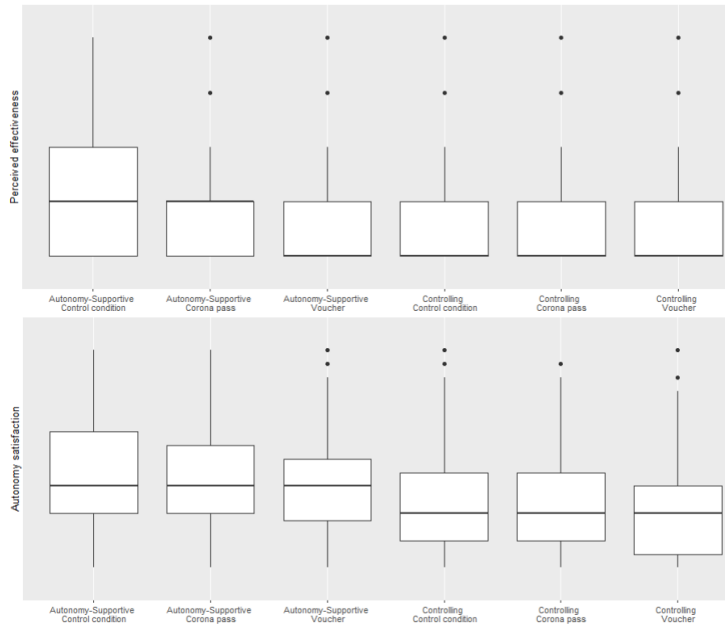
Note. The effect sizes (calculated as the partial eta squared) of the main effects were large for all outcomes, except for autonomy satisfaction.

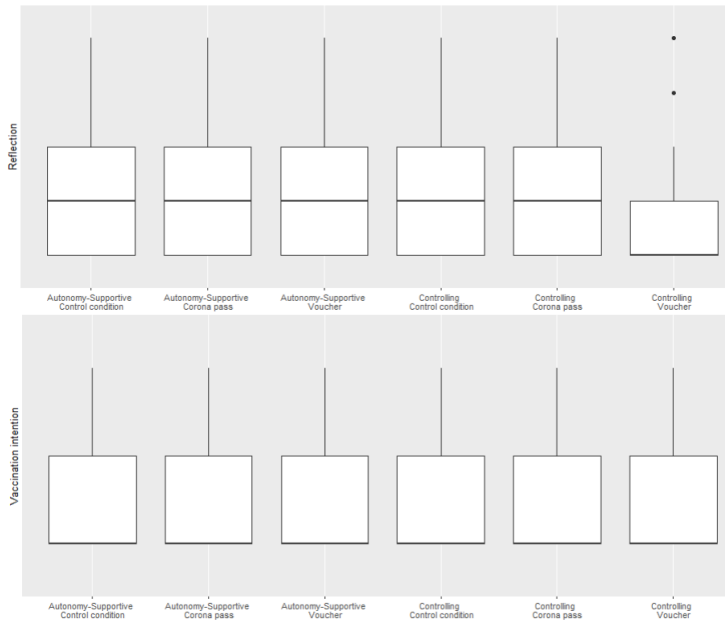
The effect sizes of the main effects were small (Cohen, 1988).

$^{***}p \leq .001$, $^{**}p \leq .01$, $^{*}p \leq .05$

~~Figure 1~~

~~Boxplots for all Continuous Outcome Variables in each Experimental Condition~~



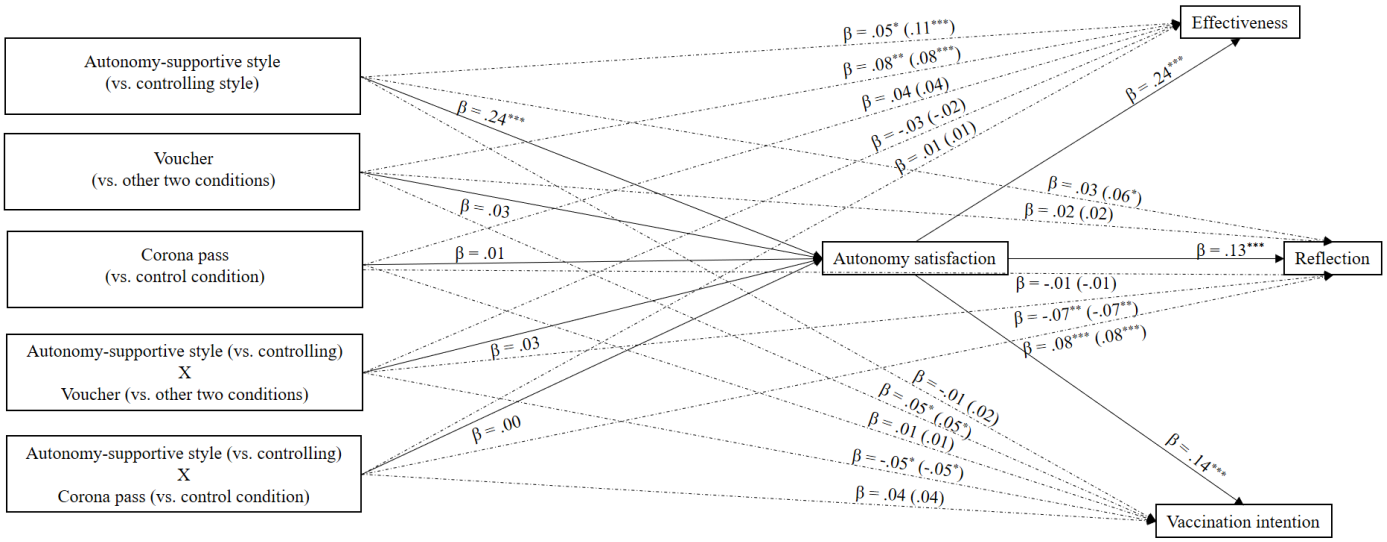


~~**Figure 2**~~

~~*Means and Standard Deviations for all Outcomes in the Six Experimental Conditions*~~

~~Figure 2a~~	~~Figure 2b~~

A Visual Representation of the Path Model



Note. Coefficients refer to the standardized direct effects, with the standardized total effects between parentheses.

Note. $R^2_{\text{autonomy satisfaction}} = .06$, $R^2_{\text{effectiveness}} = .07$, $R^2_{\text{reflection}} = .03$, $R^2_{\text{vaccination intention}} = .03$.

$^{***}p \leq .001$, $^{**}p \leq .01$, $^{*}p \leq .05$