Exploring Psychological Determinants of Adherence to COVID-19 Restriction Measures: A Study Utilizing the Theory of Planned Behaviour, Anticipated Regret and Trust.

Master Thesis

Yvo Noltes (s4368951)

Department of behavioural, Management and Social Sciences

Psychology of Conflict, Risk and Safety

University of Twente, Enschede

First supervisor: N.M.A. Huijts

Second supervisor: dr.ir. P.W. De Vries

2024

UNIVERSITY OF TWENTE.

Abstract

The COVID-19 pandemic forced the Dutch government to implement strict measures, including lockdowns and curfews, and therefore demanding a lot from its population. When using these intrusive measures, it is crucial to understand the psychological factors that influenced adherence to those preventive measures. This study, involving 105 participants in the Netherlands, examined how attitude towards the usefulness of preventive measures, attitude towards the severity of a covid infection, perceived behavioural control, subjective norms, trust in the competence of the government, trust in the safety of the vaccine, and anticipated regret influenced intentions to comply with COVID-19 preventive measures. Using an online questionnaire with a non-probability sampling method, participants responded to statements based on a realistic scenario. Results revealed significant positive correlations between the intention to comply with preventive covid measures and attitude, perceived behavioural control, anticipated regret, and trust in vaccination programs. However, subjective norms did not exhibit a significant correlation with intentions. These findings highlight the relevance of the theory of planned behavior and the significance of additional constructs in predicting behavior. Furthermore, the study offers insights into how Dutch residents perceived the COVID-19 outbreak and the government measures. Finally, the lessons learned provide valuable knowledge for addressing future global health crises.

Keywords: COVID-19, theory of planned behaviour, trust, anticipated regret, compliance

Introduction

The global outbreak of the coronavirus (COVID-19) has posed unprecedented challenges to societies worldwide, necessitating the implementation of various preventive measures to curb its spread. These measures, ranging from social distancing and mask-wearing to lockdowns and vaccination campaigns (WHO, 2020), have sparked considerable public discourse and elicited diverse reactions within communities, including those in the Netherlands (NCTV, 2021; NOS, 2022b; NOS, 2022c). Understanding the factors influencing individuals' acceptance of these covid-19 measures is crucial for public health interventions and policy formulation. This study sought to unravel the complexities of acceptance with covid measures by applying the theory of planned behaviour (TPB), extended by the construct of anticipated regret and trust, within the context of the Netherlands.

The Dutch government has primarily relied on non-coercive methods to combat the coronavirus, such as providing information and implementing stay-at-home orders, mandatory mask-wearing, social distancing, and hygiene protocols. As a result, these measures heavily rely on the voluntary cooperation of the Dutch population. It is therefore important to understand the psychological factors that influence the intention to comply. However, a complicating factor is the lack of trust in the Dutch government imposing these rules.

According to measurement round seventeen, conducted by the National Institute for Public Health and the Environment (RIVM) on 28 November 2021, individuals were adhering more to preventive covid-19 measures compared to the previous measurement rounds. However, trust in the government's handling of the virus had reached a record low, including a low level of trust in vaccinations (NOS, 2021; RIVM, 2021a; RIVM, 2021b; RIVM 2021c; NOS, 2022; De Gelderlander, 2022). Given this low level of trust in those institutions, to what extend were individuals willing to abide by the measures if they already had low trust in the organisations imposing those measures?

Compliance to preventive covid measures can also be influenced by the social context. Individuals who consider the consequences of their actions may adjust their behaviour when they anticipate negative consequences (Zeelenberg, 1999). For instance, when people consider the potential of transmitting covid to someone else, they may be more likely to alter their behaviour to prevent such transmission. They anticipate regret regarding their behaviour and, as s result, are inclined to make alterations.

The aim of this research is to understand the factors that influence the intention on compliance with preventive measures against covid-19 among the Dutch population, using the theory of planned behaviour, extended with anticipated regret and trust. This leads to the following research question.

What are the psychological factors that influence the intention to comply with preventive covid-19 measures among Dutch individuals, and to what extent does anticipated regret and trust influence these intentions?

Theoretical framework

Theory of planned behaviour

As mentioned in the introduction, this study is based on the theory of planned behaviour and is extended with the constructs of anticipated regret and trust. The theory of planned behaviour, developed by Ajzen in 1991, posits that an individual's behavioural intention is a key determinant of actual behaviour. It identifies three primary constructs: attitude, subjective norms, and perceived behavioural control (PBC). These constructs collectively shape an individual's intention to engage in a particular behaviour (Ajzen, 1991).

The construct of attitude refers to the degree to which a person has a favourable or unfavourable evaluation of the behaviour of interest. Subjective norms refers to the belief about whether other people approve or disapprove the behaviour. Lastly, PBC refers to a person's perception of the ease or difficulty in performing the behaviour of interest (Ajzen, 1991).

The TPB has been widely used to predict and explain various health-related behaviours and is proven successful in predicting those behaviours (Godin & Kok, 1996). A number of recent studies all found evidence for the explanatory effect of the TPB variables in predicting individuals' intention to adhere to preventive covid measures (Hagger, Smith, Keech, Moyers, & Hamilton, 2020; Shanka & Gebremariam Kotecho, 2021; Gibson, Magnan, Kramer, & Bryan, 2021; Shmueli, 2021; Yu, Lau, & Lau, 2021). Therefore, the TPB is believed to be a useful model for this study. To improve the predicting powers of the TPB, this study incorporates the model with two additional constructs: anticipated regret and trust.

Anticipated regret

Anticipated regret refers to the emotional response individuals expect to experience if they fail to adopt a recommended behaviour (Loomes & Sugden, 1982; Zeelenberg, 1999). When individuals make decisions, that do not result in their desired outcome, they may experience a variety of negative emotions, and humans tend to make decisions that have the least likelihood of causing despair or regret (Janis & Mann, 1977; Loomes & Sugden, 1982). When the decision maker is made aware of potential post-decisional regret at the time of decision making, this anticipation of regret can lead to risk-averse tendencies (Zeelenberg, 1999). Additionally, anticipated regret can be of significant influence in predicting behaviour with preventive corona measures. Recent studies demonstrated that anticipated regret was a strong predictor of vaccination intentions (Wolff, 2021), the intention to get tested for covid-19 (Ravert, Fu, & Zimet, 2021), and it had a positive influence on health promoting behaviours, and vaccination acceptance (Kowalski & Black, 2020; Ravert, Fu, & Zimet, 2021). Finally, Hagger et al. discovered evidence supporting the impact of anticipated regret on the intention to adhere to social distancing measures. It is noteworthy, however, that this effect was observed only in the U.S. sample and not in the European sample (Hagger, Smith, Keech, Moyers, & Hamilton, 2020).

Since previous studies had demonstrated that the inclusion of anticipated regret significantly enhances the predictive power of the TPB (Parker, Stradling, & Manstead, 1996; Conner & Armitage, 1998; Sandberg & Conner, 2008), and given the indication from the recent studies that anticipated regret may influence the intention to comply with preventive covid measures, this construct is subsequently incorporated into the model.

Trust

According to the Cambridge Dictionary, trust is defined as the belief someone is good and honest and will not harm you, or that something is safe and reliable (Cambridge, 2024). In relation to this study, it could refer to the belief that the government is honest, and the corona vaccine is safe and reliable. In a behavioural context, trust held significant influence over individuals' attitudes and behavioural intentions (Pagliaro et al., 2021).

The level of trust individuals placed in governmental competence can shape their attitudes towards the perceived usefulness of preventive measures (Margraf, Brailovskaia, & Schneider, 2020). In the context of public health, trust in the government becomes an essential precondition for successful implementation of preventive measures and encouraging compliance with recommended guidelines (Blair et al., 2017). Consequently, it may influence

their intention to comply with public health measures, including social distancing, mask wearing, and vaccination campaigns. Given the existing understanding of the relationship between trust and governmental interventions, recent research indicated that individuals who exhibited distrust in the government were more likely to harbour lower intentions to adhere to preventive covid-19 measures (Clark, Davila, Regis, &; Raude et al., 2020; Kraus, 2020; Guillon & Kergall, 2021; Nivette et al., 2021).

Furthermore, trust in the safety of an vaccine was an important determinant of the success of vaccination campaigns (Wong & Jensen, 2020; Abedin et al., 2021). Vaccine acceptance was not only influenced by the efficacy and safety of vaccines but was also closely linked to the trust individuals placed in the institutions endorsed, produced, and distributed vaccines (Paredes, Apaolaza, Marcos, & Hartmann, 2021). Moreover, the association between trust in the safety of the vaccine and the intention to comply with preventive measures may be mediated by the attitude towards the severity of a covid infection. If an individual perceived the severity of a covid infection to be high, they were more likely to trust and opt for the covid vaccine (Karlsson et al., 2021).

Considering the current knowledge on trust in relation with covid-19, a noticeable trend was the prevalent global scepticism regarding the effectiveness of covid vaccines (de Figueiredo, Simas, Karafillakis, Paterson, & Larson, 2020). Research showed that concerns about vaccine safety and mistrust in the vaccine development process were closely linked to vaccination intentions and attitudes, indicating that covid-19 risk perceptions played a significant role in vaccine uptake (Guillon & Kergall, 2021). Considering findings from these recent studies, it seemed that trust was a predictor of individuals' attitude, which was itself an important predictor of intention to comply with preventive covid measures. Consequently, the constructs of trust in the government and trust in vaccination acceptance were incorporated into the research model.

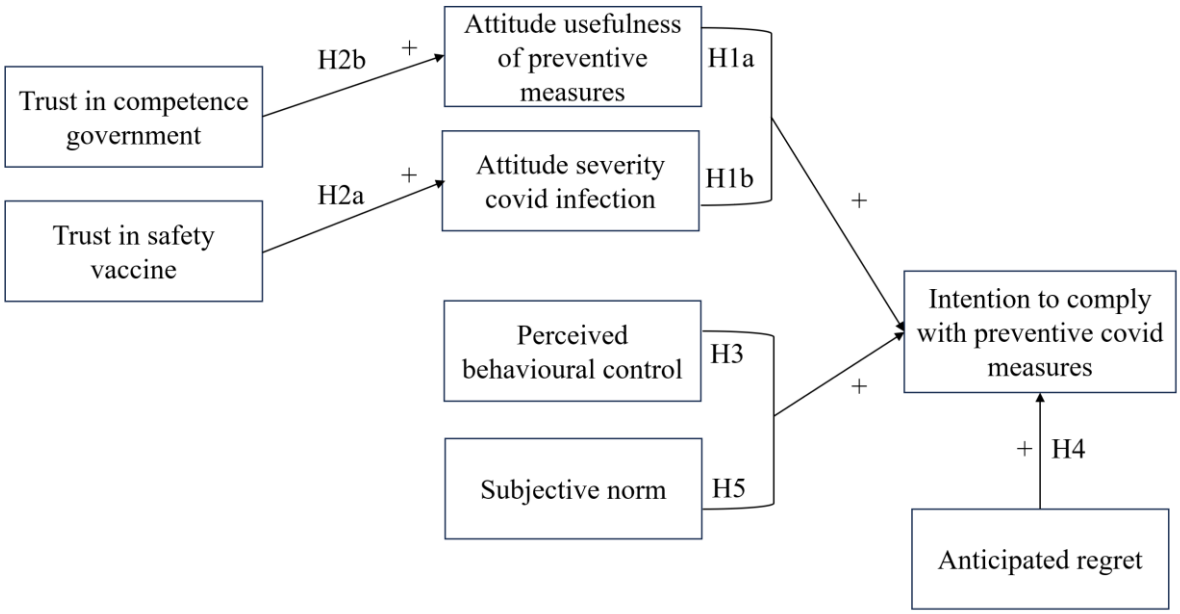
Current study

The theoretical framework outlined seven constructs, important for predicting an individual's intention to comply with preventive covid measures. These constructs included attitude towards the usefulness of measures (UOM), attitude towards the severity of a covid infection, subjective norms, PBC, anticipated regret, trust in the competence of the government and trust in the safety of the vaccine. Age and educational level were incorporated as covariate variables in the analysis. Initially, this study sought to clarify the connection between the identified variables and the intention to engage in compliant

behaviour within the Dutch population through the administration of a questionnaire survey. Subsequently, this research aimed to gain insight into individuals' perspectives on preventive measures through the utilization of open questions. Based on the literature, the following hypotheses were formulated, and are shown in figure 1.

Figure 1

Conceptual Model of the Hypothesised Correlations Between the Variables



H1a: Attitude towards the usefulness of preventive covid-19 measures is positively related with the intention to comply with those measures.

H1b: Attitude towards the severity of the covid virus is positively related with the intention to comply with those measures.

H2a: Trust in the safety of the covid vaccine is positively related with the intention to comply with preventive covid measures, with attitude towards severity of a covid infection mediating this relationship.

H2b: Trust in the competence of the government is positively related with the intention to comply with preventive covid measures, with attitude towards UOM mediating this relationship.

H3: Perceived behavioural control is positively related with the individual's intention to comply with preventive covid measures.

H4: Anticipated regret is positively related with the intention to comply with preventive covid measures.

H5: Subjective norms (i.e., supportive appraisal of others on covid measures) on compliance with preventive measures are positively related with the intention to comply with preventive covid measures.

Methods

Design

The research used a questionnaire survey design to assess the psychological factors that influenced individuals' intention to comply with preventive measures against covid-19. Based on the TPB, the questionnaire included the variables attitude, subjective norms, and perceived behavioural control, extended by the inclusion of anticipated regret and trust, all served as independent variables. The dependent variable was the intention to comply with preventive covid measures.

Participants

Participants were included in the study if they were over 18 years old, lived in the Netherlands and could understand the Dutch language of the questionnaire. No other inclusion criteria were used. The recruitment was done through non-probability convenience sampling, which was promoted via social media platforms (Facebook, LinkedIn, WhatsApp) and personal connections. Participants were also asked to share the questionnaire with their friends and family. Data collection took place from June to July 2022 and a total of 125 participants took part in the study. Twenty participants were excluded from the study for not completing the questionnaire in full.

Fifty-five respondents were male and forty-six female. The participants' age ranged from 18 to 69 years old, with a mean age of 35 (SD = 12.4 N = 105). Educational level ranged from *lower than vocational education* (6.4%), *vocational education* (41.6%), *bachelor's degree* (30.4%), to *master's degree* (13.6%).

Materials

The initial questionnaire consisted of 55 Likert-scale items, three demographic items, and two open-ended items. Respondents answered the Likert-scale items on a five-point scale (*1= strongly disagree, 5 = strongly agree*). As the likelihood of a covid infection during the data collection period was low, a hypothetical scenario was created. This scenario was set in September, several months after the data-collection. In this scenario, the probability of a covid infection was elevated, attributed to the emergence of a new type, the Poseidon variant. The survey items were formulated based on this hypothetical scenario (Appendix A). In total, three items were developed to measure demographics, including age, gender, and educational level. The open-ended questions were formulated as followed: "Do you currently have doubts about the corona vaccine?" and, "Were there covid measures that you found hard to follow?"

Measures

The initial questionnaire included nine items to measure the intention to comply with preventive covid measures. An example item for the construct intention to comply with preventive corona measures was "I intent to wear a face mask where necessary."

Next, attitude was measured on two sub-scales. Three items were used to measure the attitude towards the severity of the Poseidon variant. An example item for this construct was "I think that an infection with the Poseidon variant could have serious health consequences." Two items were used to measure the construct attitudes towards UOM. One example item was "I think the measures are helping against the spread of the Poseidon variant."

The construct of PBC was measured with twelve items. One example item measuring this construct was "I am able to get a vaccine or follow-up shot."

Subjective norms were measured with five items. "People who are important to me would think I should comply with the corona measures," was one item used to measure subjective norms.

Furthermore, to measure trust on the safety of the vaccine, two items were used. "I trust the safety of the current corona vaccine," was one item used to measure this construct. In addition, trust in the competence of the government was measured with five items. An example item for this construct was "I have confidence in the government's competence in controlling another corona outbreak."

Lastly, six items were used to measure anticipated regret. One example item was "I think I would regret it when I get corona and get sick as a result."

Procedure

After approval from the University of Twente's Ethical Committee, the questionnaire was distributed and promoted through the social media platforms, Facebook, LinkedIn, and WhatsApp. In addition, a QR code was used with a link to the questionnaire. Before participants could start, they were given information about the purpose and duration of the questionnaire. Furthermore, a privacy statement and contact details of the researcher were given (Appendix B) Hereafter, participants could start with the items and open questions.

Data analysis

The data was collected with Qualtrics software. The raw data was downloaded and further processed via IBM SPSS Statistics software (version 28.0.1.0). It was assured that all measurement scales were correct.

The scale's quality was evaluated by conducting factor analysis, using Principal Axis Factoring and Varimax rotation. Kaiser's criterion with eigenvalues greater than 1.0 were used. The analysis was conducted for each variable. Additionally, internal reliability was assessed through the analysis of Cronbach's Alpha (α) after factor analysis was completed.

Factor analysis

The Principal Axis factoring analysis (PAFA) on the nine items measuring intentions initially yielded a two-factor solution. Item "I would only adhere to the corona measures if they were policed" scored low on both factors. When this item was removed, the analysis yielded one factor with an eigenvalue exceeding 1.0. This factor explained 63% of the variance. The factor loadings, as displayed in Appendix C, were all above 0.6, indicating a robust factor structure. To evaluate the intentions sub-scale's internal consistency, Cronbach's alpha was computed and revealed an excellent consistency of .91.

Next, the attitude subscales attitude towards severity (three items) and attitude UOM (two items) were analysed. Although two factors, namely attitude towards severity and attitude towards UOM were expected, the analysis only yielded one factor. Item "When elderly people become infected with the Poseidon variant, it can be very harmful to their health," scored below 0.6 and was subsequently excluded from further analysis. The reliability analysis of the attitude subscale demonstrated good internal consistency with a Cronbach's alpha of .84. Therefore, a new variable was created by combining the two factors, referred to as attitude towards usefulness of preventive measures of the Poseidon variant, which explained 69% of the variance and had strong factor loadings (see Appendix C). Since

there was not compelling evidence for two factors, hypothesis 1b was excluded form further analyses.

Thirdly, a factor analysis was performed on seven items measuring trust on the safety of the vaccine and competence of the government. The PAFA resulted in a one-factor solution and all factor loadings were acceptable, accounting for 72% of the variance. The reliability analysis of the seven items on the trust subscale indicated strong results, with a Cronbach's Alpha of .93. Although it was anticipated that trust would have two factors, namely trust in competence of the government and trust in the safety of the vaccine, these were not detected in the analysis. Therefore, the trust variables were combined to form a new variable: overall trust in vaccination programs. This item indicated strong factor loadings as seen in Appendix C. Since the factor analysis did not provide support for the existence of the two factors, hypotheses 2a and 2b could not be substantiated.

Fourth, the PAFA on twelve items of the PBC subscale initially resulted in a three-factor solution. However, item "I am able to avoid infecting others with the new corona variant" scored on factors 2 and 3 without .20 difference in variance and was thus excluded from further analysis. During secondary analysis, three items: "I can decide for myself if I adhere to preventive COVID measures," "I have the ability to follow preventive COVID measures," "I can work from home as much as possible" were removed due to low factor loadings. Following the removal of these items, a two-factor solution was extracted, explaining 67% of the variance. The items "I am able to avoid getting infected with the new Poseidon variant," and "I am able to avoid infecting others with the new Poseidon variant," loaded on factor two as displayed in Table 1. Factor one seemed to measure specific behaviour, whereas factor two appeared to measure specific control over getting infected. Therefore, two factors were created: PBC over actual preventive behaviour and PBC over getting infected. Results from the factor analysis for both sub-scales demonstrated good results (Appendix C).

In addition, when assessing the two factors individually, the reliability analysis for factor one (actual preventive behaviour) demonstrated strong internal consistency with a Cronbach's Alpha of .87. On the other hand, factor two (control over getting infected) yielded a Cronbach's Alpha of .76, also suggesting good reliability. However, it is important to note that since factor two consists of two items, it may not provide a robust measure. To further examine the reliability, an inter-item correlation test was conducted, indicating a correlation of .62. This weak correlation between the two items suggested that the reliability of factor two might have been compromised due to the limited number of items. However, one item

assessed control over getting infected, while the other was about infecting other people, indicating that they did not measure the same aspect.

Table 1.

Rotated Factor Matrix Perceived Behavioural Control

	Factor	
	1	2
I am able to avoid getting infected with the new Poseidon variant.		.839
I am able to get a booster/vaccine.	.645	
I am able to avoid infecting others with the new Poseidon variant.		.743
I am able to avoid meeting acquaintances.	.752	
I am able to avoid crowded places.	.737	
I am able to keep 1.5 meters away from others.	.612	
I am able to wear mouth masks.	.892	
I am able to wash hands often.	.777	

Note. N = 105. Extraction method: Principal Axis Factoring. Rotation method: Varimax with Kaiser Normalization. Outcomes after removal of items 18.1, 18.2, 19.1 and 19.7

A factor analysis of the six items measuring anticipated regret, revealed a one-factor solution, as shown in Appendix C. Item "I think I would regret it if, in the month of September, my behaviour led me to be addressed for not adhering to corona measures" scored relatively low with .65, while all other items scored .74 or higher. The one-factor solution accounted for 70% of the variance. The reliability test showed an excellent result ($\alpha = .91$). Although removing item "I think I would regret it if, in the month of September, my behaviour led me to be addressed for not adhering to corona measures" would increase the alpha to .92, this increase was minimal, so the item was retained in the analysis.

Finally, the five items of the subjective norm subscale were analysed, resulting in a one-factor solution. All items had acceptable factor loadings. Reliability tests showed good internal consistency (Cronbach's alpha $\alpha = .87$). Table 2 provides a summary of the outcomes from the factor analysis, including means, standard deviations, and Cronbach's alpha (α).

Table 2

Items per construct and their respective Cronbach's alpha (α)

Construct		Items	*M*	*SD*	α
Intention to comply with Corona measures		*I intent to:*	3.63	1.17	.91
	1.	comply with the corona measures,			
	2.	keep 1.5 meters of distance,			
	3.	wear a face mask where necessary,			
	4.	stay at home with corona-related complaints,			
	5.	wash my hands often,			
	6.	sneeze in my elbow,			
	7.	do a self-test for corona-related symptoms,			
	8.	get a vaccine or booster shot.			
Attitude towards usefulness of measures	1.	*I think that:*	3.55	1.14	.84
	2.	an infection with the Poseidon variant could have serious health consequences,			
	3.	I could get very sick of the Poseidon version,			
	4.	the measures are helping against the spread of the Poseidon variant,			
	5.	it is important to implement the preventive measures against the spread of the Poseidon variant.			
Overall trust in vaccination programs	1.	I trust the safety of the current corona vaccine,	2.92	1.15	.93
	2.	the effectiveness of the current corona vaccine.			
	3.	I have confidence in the competence of pharmaceutical organisations in developing a safe vaccine against corona.			
	4.	I have trust in the government's competence in controlling another corona outbreak.			
	5.	I trust the information the authorities will provide on the new corona outbreak.			
	6.	I have confidence in the government's decisions to combat the corona outbreak.			
	7.	I have trust in the government's ability to adequately manage the crisis.			
PBC actual preventive behaviour		*I am able to:*	3.51	1.13	.87
	1.	get a vaccine or follow-up shot,			
	2.	avoid encounters with acquaintances as much as possible,			
	3.	avoid places where there are many people,			
	4.	keep 1.5 meters of distance to others,			
	5.	wear a face mask,			
	6.	wash hands often.			
PBC control over getting infected*		*I can avoid:*	2.81	0.98	.76
	1.	getting infected with the new Poseidon variant,			
	2.	infecting others with the new Poseidon variant.			
Anticipated regret		*I think I would regret it when:*	3.47	1.16	.91
	1.	my behaviour in September causes me to pass the corona virus to someone else,			
	2.	contract corona and get sick as a result,			
	3.	when I get corona and fall ill as a result cannot participate in leisure activities because I have caught the coronavirus,			
	4.	infected a family member who became very ill from it,			
	5.	being addressed because I did not comply with the corona measures,			
	6.	infected someone important to me with the new coronavirus.			
Subjective Norms		*People who are important to me would:*	3.26	0.98	.87
	1.	People who are important to me would think I should comply with corona measures,			
	2.	would support my decision to comply with the corona measures,			
	3.	disapprove if I did not adhere to the corona measures,			
	4.	think I should get vaccinated,			
	5.	agree with government's corona policy.			

Note. $N = 105$. Original items were in Dutch. Results after removal of low scoring items. * Score may not reliable since only two items were measured. ** Answered on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree)

Sociodemographic factors

Several studies indicated the effect of socio-demographic factors, such as age, gender, and educational level (Levkovich, 2020; Solomou & Constantinidou, 2020; Pennycook, McPhetres, Zhang, Lu, & Rand, 2020; Lin, Harris, Heemskerk, Van Bavel, & Ebner, 2021; Rattay et al., 2021; Nivette et al., 2021), therefore, this study has included these variables as a covariate.

Results

Descriptives and correlations

Table 3 gives a representation of the Pearson correlations for the measured constructs: age, gender, education, intentions, attitude UOM Poseidon, overall trust in vaccination programs, PBC over getting infected, PBC over actual preventive behaviour, anticipated regret, and subjective norms.

The intention to comply with preventive covid measures, showed significant positive correlations with most of the variables, except for PBC over getting infected, which showed a non-significant correlation. The positive correlations between intentions and those variables suggested a relationship between the intention to comply with preventive covid measures and the levels of trust in vaccination programs, perceived behavioural control over actual preventive behaviours, anticipated regret, and subjective norms.

Attitude towards the usefulness of measures Poseidon indicated a positive correlation with the intention to comply with preventive covid measures, suggesting that when a person had a positive attitude towards the preventive measures, that person had also been more inclined to adhere with those preventive covid measures.

Trust in vaccination programs showed a positive correlation with the intention to comply, indicating that higher levels of trust increased the intention to comply with preventive measures. However, attitude was expected to mediate this relationship.

Perceived behavioural control over actual preventive behaviour demonstrated strong positive correlations with intentions. The strong correlation with intention indicated that individuals who perceived a heightened sense of control over their preventive behaviour tend to exhibit a higher intention to comply with preventive covid measures.

Anticipated regret showed strong correlations with intentions, The positive correlation observed between anticipated regret and intentions aligned with the expectation, suggested

that when individuals experience a sense of anticipated regret, it would positively impact their intention to adhere to preventive covid measures.

Lastly, the variable subjective norm also demonstrated strong correlations with intentions. This correlation suggested that when important relatives convey their views on the individual's preventive behaviour, these opinions exert a positive influence on the individual's intention to comply with preventive covid measures. Concerning demographic variables, it was observed that the intention to comply with preventive covid measures was higher among females than males, and younger respondents indicated less perceived behavioural control over actual preventive behaviour compared to elder respondents. Appendix E offers a summary of these findings.

Table 3

Pearson Correlations of all Variables

	1	2	3	4	5	6	7	8	9
1. Age	--								
2. Gender	.136	--							
3. Education	-.408**	-.168	--						
4. Intentions	.044	.161.	.205*	--					
5. Attitude UOM	.071	.071	.119	.779**	--				
6. Trust vaccination programs	.005	.015	.131	.757**	.723**	--			
7. PBC preventive behaviour	.144	.234*	.009	.770**	.690**	.700**	--		
8. PBC getting infected	-.137	-.247*	.029	.165	.127	.214*	.010	--	
9. Anticipated regret	.110	.112	.139	.765**	.748**	.708**	.683**	0.73	--
10. Subjective Norm	.102	.107	.113	.739**	.653**	.695**	.737**	-.003	.688**

Note. $N = 105$. * Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed)

Multiple regression analysis

A multiple regression analysis was preformed to test whether the predictors attitude UOM Poseidon, overall trust in vaccination programms, PBC over actual preventive behaviour, PBC over getting infected, anticipated regret and subjective norms, significantly predicted the dependent variable, intention to comply with preventive covid measures. Gender, age, and educational level were added as a covariate. Analysis indicated that the model significantly predicted the intention to comply with preventive covid measures, F (9, 82) = 42.788, p < .001. Moreover, the model explained 82% of the variance in intention to comply with preventive covid measures. Table 4 is providing an overview of the results.

The Findings indicated a marginally significant impact of attitude UOM Poseidon on the intention to comply with preventive measures (ß = .16, t = 2.00, p .050). Although two hypotheses for attitude were formulated (H1a and H1b), the composite measure, which was combined based on factor analysis, suggest similar outcomes, hinting on the effect of attitudes on intentions to comply. Therefore, hypothesis 1a which suggested that attitude towards the usefulness of preventive covid measures was positively related with the intention to comply with those measures, was supported.

The findings further showed that overall trust in the vaccination programmes had a significant influence on the intention to comply with preventive covid measures, with attitude towards UOM Poseidon mediating this relationship. Mediation analysis indicated a significant relationship between trust and attitude (b = .72 t(96) = 9.73 p = <.001), and the association between attitude and intention was also found to be significant b = .46 t(96) = 2.72 p = <.001). Following a significant Sobel test (p <.001), the outcome indeed indicated that attitude served as a moderator variable between trust and intentions. Although the two initial trust variables were taken together, the results were confirming the initial relationship between trust and intentions, with attitude serving as a mediator, indicating support for hypotheses 2a and 2b. Appendix D offers a summary of the findings obtained from the Sobel test.

Furthermore, to test whether PBC over actual preventive behaviour ((ß = .44, t = 5.34, p <.001) and PBC over getting infected ((ß = .11, t = 2.17, p .033) significantly affected the intention to comply with preventive covid measures, the analysis indicated significant effects for both predictors, listed in table 4. Hence, there is compelling evidence that both factors independently had a significant effect on individuals' intention to comply with preventive covid measures, and therefore the regression analysis provided support for hypothesis three.

Anticipated regret on the intention to comply with preventive covid measures

indicated a strong positive effect on intentions (ß = .20, *t* = 2.60, *p* .011). Therefore, hypothesis four, which proposed that, anticipated regret is positively related with the intention to comply with preventive covid measures, was supported by the results of the multiple regression analyses.

Lastly, the regression analysis indicated that subjective norms had a non-significant relationship with intentions (ß = .11, *t* = 1.34, *p* .184). Hypothesis five, which stated that, subjective norms on compliance with preventive measures is positively related with the intention to comply with preventive measures, could therefore not be supported.

Table 4

Multiple Regression Model of all Variables on the Dependent Variable: Intention to Comply with Preventive Covid Measures

Variable	B	Std. Error	β	*T*	*p*	Lower Bound	Upper Bound
(Constant)	-3.22	2.74		-1.18	.242	-8.67	2.22
Age	-0.03	0.03	-.06	-1.13	.263	-0.09	0.02
Gender	1.05	0.70	.08	1.50	.139	-0.35	2.45
Education	0.78	0.46	.09	1.70	.093	-0.13	1.69
Attitude UOM Poseidon	0.30	0.15	.16	2.00	**.050**	0.00	0.59
Overall trust vacination programms	0.09	0.09	.08	1.04	.303	-0.08	0.26
PBC actual preventive behaviour	0.60	0.11	.44	5.34	**<.001**	.038	0.83
PBC over getting infected	0.43	0.20	.11	2.17	**.033**	0.04	0.82
Anticipated regret	0.25	0.10	.20	2.60	**.011**	0.06	0.45
Subjective norm	0.16	0.13	.11	1.34	.184	-0.09	0.44

Note. N = 105. Outcome variable: 'Intention to comply with preventive covid measures.' UOM = Usefulness of measures. PBC = Perceived Behavioural Control. Significant values appear in bold.

Qualitative analysis

The questionnaire contained two open-ended items. The first item examined possible doubts about the vaccine, the second item examined possible difficulties experienced with preventive covid measures. These items were analysed using inductive coding (Braun & Clarke, 2006). In this bottom-up approach, codes were generated when they occurred four or more times in the responses. Tables 5 and 6 show the results of the open items. When asked

about their doubts regarding the corona vaccine, approximately half of the respondents (51%) indicated that they did not have any doubts. However, they did not provide any specific reasons for their lack of doubts. Around 10% of the respondents mentioned that their confidence stemmed from their trust in rigorous research conducted on the potential side effects of the vaccine. Conversely 17% of the participants expressed doubts regarding the efficacy of the vaccine. Another 11% specifically harboured concerns about the uncertainty surrounding its long-term effects. Additionally, 7% of the respondents were sceptical about receiving future vaccines, while 4% believed that the rapid development of the vaccine hindered their willingness to get vaccinated.

When participants were asked about the covid measures they found challenging to adhere to, 30% of the respondents expressed that they did not encounter any difficulties. One respondent explained, "I followed the measures because I understood the seriousness of the situation." Among those who did face challenges, the curfew measures were mentioned most frequently, with 29% of the respondent's indicating difficulty in complying them. This was followed by the distancing measures, which 20% of the respondents found challenging. Additionally, 17% of the respondents expressed struggles with the isolation measures.

Table 5.

Coding scheme Q1; Do you currently have doubts about the corona vaccine?

Code	Statements	Frequency (%)
1. No doubts (unspecified)	"No"	54 (51.4%)
2. No Doubts (trust in science/research)	"No [doubts]. I trust that decent research has been done on the effects and side effects of the vaccine."	10 (9.5%)
3. Doubts on efficacy	"I think the vaccine is decreasing in strength, so you have to get a new vaccine every time."	18 (17.1%)
4. Doubts on (long-term) effects	"It is too uncertain for me what the long-term side effects will be."	12 (11,4%)
5. Doubts about rapid development	"I did not have the vaccine, because I think it developed too quickly."	4 (3.8%)
6. Doubts about future vaccinations	I had three [vaccinations], but I don't think I will take any more."	7 (6.7%)

Note. $N = 105$. Some participants had multiple doubts.

Table 6.

Coding scheme Q2; Were there covid measures that you found hard to follow?

Code	Statements	Frequency (%)
1. Cooperative	"No [difficulties], I followed the measures because I understood the seriousness of the situation."	32 (30%)
2. Curfew	"I found the curfew the hardest, I was working on my thesis and when I finished, I had to sit inside for the rest of the evening."	31 (29%)
3. Keeping distance	"I found it difficult to keep my distance from others, especially with family and friends."	21 (20%)
4. Isolation	"The [restriction] of visitors at home, especially Christmas with family was difficult, given various opinions within the family."	18 (17%)

Note. $N = 105$.

Discussion

This study investigated which psychological characteristics affected the intention to comply with preventive covid measures, based on the theory of planned behaviour, with the additional predictors anticipated regret and trust. This research showed that there was a relationship between individuals holding a positive attitude towards the usefulness of the preventive covid measures and their intention to comply with such measures. This knowledge could be exceptionally valuable, particularly for governments and public health organizations dealing with future health crises, whether on a global or local scale. These findings underscored the importance of regulatory authorities in carefully evaluating and ensuring usefulness of preventive health measures for the general public. While this may seem like a self-evident point, results from measurement rounds conducted by the Dutch Institute for Public Health (RIVM) (Rijksoverheid, 2023) and statements given by respondents in this research, concerning preventive behaviours, revealed that a proportion of individuals in the Netherlands did not perceive certain measures as useful. As a result, and consistent with the findings of this study, they showed decreased intentions to comply with these preventive

measures, potentially leading to heightened health risks for both themselves and others.

Furthermore, it was found that overall trust in vaccination programms significant influenced the intention to comply, with attitude towards the usefulness of preventive measures mediating this relationship. When individuals trusted the vaccination programms, they thus had more favourable attitudes, and this positive mindset in consequence, enhanced their intention to comply with preventive corona measures. This finding highlighted the importance of fostering trust to promote positive attitudes, and subsequently increasing the likelihood of adherence to preventive corona measures. These results were in line with current research on the mediating effect of attitude between trust and intentions (Yasa et al., 2022).

Although it was not hypothesized, this research found two distinct factors of perceived behavioural control: control over actual preventive behaviour and control over getting infected. These two variables were the strongest predictors of the intention to comply with preventive covid measures. It was found that individuals were more inclined to comply when they perceived greater control over their actual preventive behaviour. This suggested that if a person was confident in their means and ability to carry out the desired behaviour (complying with preventive covid measures), they were actually more likely to do so. This finding is in line with the current knowledge on perceived behavioural control. Recent studies indeed found significant associations between PBC and preventive behaviour, indicating that perceived behavioural control is an important predictor of the intention to comply with preventive covid measures (Aschwanden et al., 2021; Fischer & Karl, 2021). This is an important finding, indicating that when future pandemics arise, lawmakers should emphasize easy ways to ensure preventive behaviour. This can be done by ensuring widespread accessibility of mouth masks, low thresholds for persons to take vaccinations and low costs or even free (covid) tests.

The findings also uncovered a noteworthy positive relation between the perceived control over getting a covid infection and the intention to adhere to preventive measures. The finding suggested that individuals who felt confident about their ability to avoid an infection, were more likely to express an intention to adopt preventive measures. This implied that they believed these measures played an important role in maintaining a safe environment and reducing the risk of contracting covid-19.

Additionally, this study uncovered strong evidence supporting the active role of anticipated regret in shaping intentions. This study revealed that elevated levels of anticipated regret had a positive impact on the intention to comply with preventive covid measures. It implied that if an individual considered engaging in behaviour contrary to preventive

measures, envisioning the negative outcomes that may ensue, such as attending a large gathering, contracting covid, and subsequently infecting a close family member, could deter them from proceeding with that behaviour and adhering to preventive covid measures instead.

These findings were in line with the current understanding on the impact of anticipated regret on the intention to comply with preventive measures. Sandberg and Conner (2008) found evidence for the significant impact of anticipated regret on predicting intentions on individual behaviour. Wolff (2021) found evidence for the strong predicting power of anticipating regret on vaccination intentions and lastly, literature supported the influence of anticipated regret on protection motivation and protective health measures against covid-19 (Kowalski & Black, 2020).

In future outbreaks of covid or other viruses, governments and public health organizations should incorporate anticipated regret with use of fear appeals into their communication By highlighting the potential consequences of behaviours that may harm not only the individual, but also those close to them, leading in subsequent regret, this approach can enhance individuals' willingness to comply with preventive health measures. The use of fear appeals has frequently led to polarizing opinions regarding their effectiveness, with studies suggested potential backfires (Stolow, Moses, Lederer, & Carter, 2020). While others found evidence supporting their efficacy (Maloney, Lapinski, & Witte, 2011). However, a comprehensive meta-analysis including numerous theories on fear appeals has provided compelling evidence. The study concluded that fear appeals were effective in positively influencing attitudes, intentions, and behaviours. Moreover, there were very few circumstances under which they were not effective, and no circumstances under which they backfired and led to undesirable outcomes (Tannenbaum et al., 2015). Effectiveness was also evident when individuals not only perceived their capability to adopt the recommended behaviour but also perceived this behaviour as a viable means of averting the identified threat (Maloney, Lapinski, & Witte, 2011). Considering these studies, integrating fear appeals into (crisis) communication is a valid and beneficial strategy to encourage the desired behaviour.

Qualitative analyses in this study found that approximately 40% of the respondents expressed hesitations regarding the covid vaccine. These reservations primarily revolved around concerns about the vaccine's effectiveness and uncertainties regarding potential long-term effects. The presence of vaccine hesitancy in this study aligned partly with current knowledge on the subject. A global study on vaccine hesitancy revealed that individuals in Western European countries tended to exhibit lower willingness to get vaccinated. The research stating that 39% of individuals in Western European countries expressed concerns

regarding vaccine safety and effectiveness (Sallam, 2021). However, this percentage varied significantly among European countries. For instance, a study by Neumann-Böhme found that only 27% of the Dutch population had reservations about the vaccine (Neumann-Böhme et al., 2020), which contrasted with the findings of previous research and this study. Furthermore, the relatively high percentage of individuals that expressed vaccine hesitancy found in this research, may have been showing signs of decline over time, as recent research suggested that covid-19 vaccine hesitancy is gradually decreasing (Qorib, Oladunni, Denis, Ososanya, & Cotae, 2023).

Considering the results, it is crucial for governments to engage in transparent and forthright communication regarding their vaccination programs. Studies on crisis communication emphasised the critical role of honesty and openness in fostering public trust (Malecki, Keating, & Safdar, 2020) and rapid response (Ophir, 2018). Additionally, prevention and mitigation of pandemics can be done by reducing anxiety and fear, supporting public adherence to mitigation strategies, reducing the burden of receiving vaccinations, and increasing the effectiveness of medical interventions (Glik, 2007).

Lastly, the qualitative analyses showed that that participants identified the curfew measures as the most challenging to adhere to, followed by social distancing and stay-at-home measures. These findings aligned with existing knowledge on compliance with preventive covid measures (RIVM, 2023). The RIVM measurement round eleven indicated that especially younger individuals had significant difficulty in compliance with curfew measures (RIVM, 2022). Additionally, individuals indicated that they found this measure to be the least effective (RIVM, 2021a). These findings were in line with this research, which indicated that younger respondents indeed were less likely to adhere to preventive measures. Furthermore, the intention to comply with preventive covid measures was higher among females compared to males, and younger respondents indicated less perceived behavioural control over actual preventive behaviour than elder respondents. Regarding social distancing, previous research had identified several known barriers, including boredom, concerns about missing social activities, challenges in maintaining distance due to work obligations, and measures lasting longer than expected (Leary et al., 2020; RIVM, 2020).

Limitations

Not in line with current studies on TPB and behaviour with covid measures (Hagger, Smith, Keech, Moyers, & Hamilton, 2020; Gibson, Magnan, Kramer, & Bryan, 202; Shmueli, 2021) was that subjective norms, age, gender, and education were not significant predictors of the intention to comply with preventive covid measures. Regarding the relationship between subjective norms and intentions it may have been that there was overlap between other variables creating multicollinearity.

Furthermore, there might have been additional explanations for the deviation from current knowledge. First, despite attempts to maintain an inclusive sample size, it is important to acknowledge that this sample did not accurately represent the entire Dutch population. Data collection relied on non-probability convenience sampling, a method that involved selecting participants based on factors such as geographical proximity and availability. Consequently, this approach introduced a significant bias by including individuals who were 'easiest' to reach, thereby complicating the task of drawing statistically significant conclusions (Galloway, 2005).

Lastly, future research can be improved by including a more diverse range of respondents. For instance, ensuring representation from individuals in each province would contribute to greater generalizability of the study findings to the entire Netherlands.

Strengths

This research confirmed the robustness of the theory of planned behaviour as a model for predicting intentions. The addition of anticipated regret and trust as extra predictors significantly enhanced the model. This study has deepened the understanding of the psychological factors influencing individuals' intentions to comply with preventive and restrictive measures, thereby contributing to public health promotion. Against the backdrop of the severe covid crisis, one of the most impactful in recent history, this research provided insights into the decision-making process of Dutch individuals who faced significant and intrusive measures that restricted their freedom. The study offered valuable perspectives on how the Dutch population perceived the preventive covid measures implemented by the government, their attitudes toward covid vaccination, and ways to enhance intentions to comply with preventive measures. By capturing the feelings and opinions of Dutch citizens regarding the governments covid preventive measures, this research contributed to our comprehension of public health measure acceptance.

Considerations for future research

Contrasting with existing research, this study found a lack of support for the influence of subjective norms on the intention to comply with preventive covid measures. Future research could explore these variables in more depth, given that existing literature indicated the potential support of the influence of subjective norms on behavioural intentions (Raude et al., 2020; Wolff, 2021).

Furthermore, future research could explore vaccine acceptance in greater depth. Outside the scope of this research, but also a very important factor in acceptance of preventive (covid) measures may be the role of social media and the so-called echo-chambers, and the role of social media in the spread of (mis)information about preventive health measures.

Finally, when considering existing literature, studies revealed additional variables influencing intentions that were not considered in this study. Shmueli (2021) demonstrated a direct impact of self-efficacy on compliant intentions, suggesting its potential inclusion in future research using the TPB.

Lastly, a Chinese study found that risk perception of the covid vaccine directly associated with attitudes and indirectly with the intention to comply (Wong & Jensen, 2020), proposing it as a potential variable for future TPB research.

Conclusion

The quantitative analysis of this study offered insights into Dutch individuals' acceptance and compliance with covid-19 preventive measures. Compliance was highest when individuals felt both the ability and means to comply, which revealed the influence of perceived behavioural control on compliant intentions. The study also highlighted the mediating role of attitude on the usefulness of preventive covid measures in shaping intentions, which emphasized the importance of fostering positive attitudes through government communication. Additionally, a robust association was found between anticipated regret and the intention to comply with preventive measures, underscoring the need for including such considerations in communication strategies.

The qualitative findings emphasized the challenges in adhering to curfew and stay-at-home measures among Dutch individuals. Concerns about vaccine acceptance, including reservations about development and long-term effects, were prevalent. Therefore, clear, and transparent communication from governments is crucial for understanding the necessity, duration, and enforcement of these impactful measures, particularly during future (global) health crises.

References

Abedin, M., Islam, M. A., Rahman, F., Reza, H. M., Hossain, M. Z., Hossain, M. A., . . . Hossain, A. (2021). Willingness to vaccinate against COVID-19 among Bangladeshi adults: Understanding the strategies to optimize vaccination coverage. *PLOS ONE*, *16*(4), e0250495. https://doi.org/10.1371/journal.pone.0250495

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-t

Ajzen, I., & Fisbbein, M. (1974). Factors Influencing Intentions and the Intention-Behavior Relation. *Human Relations*, *27*(1), 1–15. https://doi.org/10.1177/001872677402700101

Aschwanden, D., Strickhouser, J. E., Sesker, A. A., Lee, J. H., Luchetti, M., Terracciano, A., & Sutin, A. R. (2021). Preventive Behaviors During the COVID-19 Pandemic: Associations With Perceived Behavioral Control, Attitudes, and Subjective Norm. *Frontiers in Public Health*, *9*. https://doi.org/10.3389/fpubh.2021.662835

Blair, R. A., Morse, B., & Tsai, L. L. (2017). Public health and public trust: Survey evidence from the Ebola Virus Disease epidemic in Liberia. *Social Science & Medicine*, *172*, 89–97. https://doi.org/10.1016/j.socscimed.2016.11.016

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Clark, C., Davila, A., Regis, M., & Kraus, S. (2020). Predictors of COVID-19 voluntary compliance behaviors: An international investigation. *Global Transitions*, *2*, 76–82. https://doi.org/10.1016/j.glt.2020.06.003

Conner, M., & Armitage, C. J. (1998). Extending the Theory of Planned Behavior: A Review and Avenues for Further Research. *Journal of Applied Social Psychology*, *28*(15), 1429–1464. https://doi.org/10.1111/j.1559-1816.1998.tb01685.x

De Figueiredo, A., Simas, C., Karafillakis, E., Paterson, P., & Larson, H. J. (2020). Mapping global trends in vaccine confidence and investigating barriers to vaccine uptake: a large-scale retrospective temporal modelling study. *The Lancet*, *396*(10255), 1–11. https://doi.org/10.1016/s0140-6736(20)31558-0

De Gelderlander. (2022, January 12). Provinciebestuur Overijssel maant kabinet: 'Lockdown niet langer verantwoord.' Retrieved February 3, 2022, from https://www.gelderlander.nl/overijssel/provinciebestuur-overijssel-maant-kabinet-lockdown-niet-langer-verantwoord~af0676e3/?referrer=https%3A%2F%2Fwww.google.com%2F

Fischer, R., & Karl, J. (2021). Predicting Behavioral Intentions to Prevent or Mitigate COVID-19: A Cross-Cultural Meta-Analysis of Attitudes, Norms, and Perceived Behavioral Control Effects. *Social Psychological and Personality Science*, *13*(1), 264–276. https://doi.org/10.1177/19485506211019844

Galloway, A. (2005). Non-Probability sampling. In *Elsevier eBooks* (pp. 859–864). https://doi.org/10.1016/b0-12-369398-5/00382-0

Gedragswetenschappelijke literatuur over COVID-19 en afstand houden | RIVM. (2020, September 1). Retrieved September 8, 2023, from https://www.rivm.nl/documenten/gedragswetenschappelijke-literatuur-over-covid-19-en-afstand-houden

Gibson, L. P., Magnan, R. E., Kramer, E. B., & Bryan, A. D. (2021). Theory of Planned Behavior Analysis of Social Distancing During the COVID-19 Pandemic: Focusing on the Intention–Behavior Gap. *Annals of Behavioral Medicine*, *55*(8), 805–812. https://doi.org/10.1093/abm/kaab041

Glik, D. C. (2007). Risk communication for public health emergencies. *Annual Review of Public Health*, *28*(1), 33–54. https://doi.org/10.1146/annurev.publhealth.28.021406.144123

Godin, G., & Kok, G. (1996). The Theory of Planned Behavior: A Review of its Applications to Health-Related Behaviors. *American Journal of Health Promotion*, *11*(2), 1–12. https://doi.org/10.4278/0890-1171-11.2.87

Guillon, M., & Kergall, P. (2021). Factors associated with COVID-19 vaccination intentions and attitudes in France. *Public Health*, *198*, 200–207. https://doi.org/10.1016/j.puhe.2021.07.035

Hagger, M. S., Smith, S. R., Keech, J. J., Moyers, S. A., & Hamilton, K. (2020). Predicting Social Distancing Intention and Behavior During the COVID-19 Pandemic: An Integrated Social Cognition Model. *Annals of Behavioral Medicine*, *54*(10), 713–727. https://doi.org/10.1093/abm/kaaa073

J. Preacher, K. (2024). Interactive Mediation tests. Retrieved December 18, 2023, from https://quantpsy.org/sobel/sobel.htm

Janis, I. L., & Mann, L. (1977). Decision Making: A Psychological Analysis of Conflict, Choice, and Commitment. Pp. vii, 488. New York: The Free Press, 1977. "5.95. *The ANNALS of the American Academy of Political and Social Science*, *449*(1), 1–2. https://doi.org/10.1177/000271628044900155

Karlsson, L. C., Soveri, A., Lewandowsky, S., Karlsson, L., Karlsson, H., Nolvi, S., . . . Antfolk, J. (2021). Fearing the disease or the vaccine: The case of COVID-19. *Personality and Individual Differences*, *172*, 110590. https://doi.org/10.1016/j.paid.2020.110590

Kowalski, R. M., & Black, K. J. (2020). Protection Motivation and the COVID-19 Virus. *Health Communication*, *36*(1), 15–22. https://doi.org/10.1080/10410236.2020.1847448

Levkovich, I. (2020). The impact of age on negative emotional reactions, compliance with health guidelines, and knowledge about the virus during the COVID-19 epidemic: a longitudinal study from Israel. *Journal of Primary Care & Community Health*, *11*, 215013272098154. https://doi.org/10.1177/2150132720981540

Lin, T., Harris, E. A., Heemskerk, A., Van Bavel, J. J., & Ebner, N. C. (2021). A multi-national test on self-reported compliance with COVID-19 public health measures: The role of individual age and gender demographics and countries' developmental status. *Social Science &Amp; Medicine*, *286*, 114335. https://doi.org/10.1016/j.socscimed.2021.114335

Loomes, G., & Sugden, R. (1982). Regret Theory: An Alternative Theory of Rational Choice Under Uncertainty. *The Economic Journal*, *92*(368), 805. https://doi.org/10.2307/2232669

Malecki, K., Keating, J. A., & Safdar, N. (2020). Crisis communication and public perception of COVID-19 risk in the era of social media. *Clinical Infectious Diseases*, *72*(4), 697–702. https://doi.org/10.1093/cid/ciaa758

Maloney, E. K., Lapinski, M. K., & Witte, K. (2011). Fear Appeals and Persuasion: A review and update of the Extended Parallel Process model. *Social and Personality Psychology Compass*, *5*(4), 206–219. https://doi.org/10.1111/j.1751-9004.2011.00341.x

Margraf, J., Brailovskaia, J., & Schneider, S. (2020). Behavioral measures to fight COVID-19: An 8-country study of perceived usefulness, adherence and their predictors. *PLOS ONE*, *15*(12), e0243523. https://doi.org/10.1371/journal.pone.0243523

Ministerie Justitie en Veiligheid. (2022, January 19). Dutch measures against coronavirus: basic rules for everyone. Retrieved February 4, 2022, from https://www.government.nl/topics/coronavirus-covid-19/tackling-new-coronavirus-in-the-netherlands/basic-rules-for-everyone

Nationaal Coördinator Terrorismebestrijding en Veiligheid [(NCTV)]. (2021). De verschillende gezichten van de coronaprotesten. *Nationaal Coördinator Terrorismebestrijding En Veiligheid (NCTV)*, 1–30. Retrieved from https://www.nctv.nl/binaries/nctv/documenten/publicaties/2021/04/14/fenomeenanalyse-de-verschillende-gezichten-van-de-coronaprotesten/Fenomeenanalyse_Coronaprotesten.pdf

Neumann-Böhme, S., Varghese, N. E., Sabat, I., Barros, P. P., Brouwer, W., Van Exel, J., . . . Stargardt, T. (2020). Once we have it, will we use it? A European survey on willingness to be vaccinated against COVID-19. *The European Journal of Health Economics*, *21*(7), 977–982. https://doi.org/10.1007/s10198-020-01208-6

Nivette, A., Ribeaud, D., Murray, A., Steinhoff, A., Bechtiger, L., Hepp, U., . . . Eisner, M. (2021). Non-compliance with COVID-19-related public health measures among young adults in Switzerland: Insights from a longitudinal cohort study. *Social Science & Medicine*, *268*, 113370. https://doi.org/10.1016/j.socscimed.2020.113370

NOS. (2021, December 19). Weer lockdown, weinig perspectief: “Let extra op je gezondheid.” Retrieved February 3, 2022, from https://nos.nl/artikel/2410147-weer-lockdown-weinig-perspectief-let-extra-op-je-gezondheid

NOS. (2022, January 16). Coronaprotest in Amsterdam met 15.000 deelnemers “vreedzaam verlopen.” Retrieved February 4, 2022, from https://nos.nl/artikel/2413283-coronaprotest-in-amsterdam-met-15-000-deelnemers-vreedzaam-verlopen

NOS. (2022c, January 16). Zij demonstreren vanmiddag tegen de corona-maatregelen. *NOS*. Retrieved from https://nos.nl

Ophir, Y. (2018). Coverage of epidemics in American newspapers through the lens of the Crisis and Emergency Risk Communication Framework. *Health Security*, *16*(3), 147–157. https://doi.org/10.1089/hs.2017.0106

Pagliaro, S., Sacchi, S., Pacilli, M. G., Brambilla, M., Lionetti, F., Bettache, K., . . . Zubieta, E. M. (2021). Trust predicts COVID-19 prescribed and discretionary behavioral intentions in 23 countries. *PLOS ONE*, *16*(3), e0248334. https://doi.org/10.1371/journal.pone.0248334

Paredes, M. R., Apaolaza, V., Marcos, A., & Hartmann, P. (2021). Predicting COVID-19 vaccination intention: the roles of institutional trust, perceived vaccine safety, and interdependent Self-Construal. *Health Communication*, *38*(6), 1189–1200. https://doi.org/10.1080/10410236.2021.1996685

Parker, D., Stradling, S. G., & Manstead, A. S. R. (1996). Modifying Beliefs and Attitudes to Exceeding the Speed Limit: An Intervention Study Based on the Theory of Planned Behavior1. *Journal of Applied Social Psychology*, *26*(1), 1–19. https://doi.org/10.1111/j.1559-1816.1996.tb01835.x

Pennycook, G., McPhetres, J., Zhang, Y., Lu, J. G., & Rand, D. G. (2020). Fighting COVID-19 Misinformation on Social Media: Experimental Evidence for a Scalable Accuracy-Nudge Intervention. *Psychological Science*, *31*(7), 770–780. https://doi.org/10.1177/0956797620939054

Qorib, M., Oladunni, T., Denis, M., Ososanya, E., & Cotae, P. (2023). Covid-19 vaccine hesitancy: Text mining, sentiment analysis and machine learning on COVID-19 vaccination Twitter dataset. *Expert Systems With Applications*, *212*, 118715. https://doi.org/10.1016/j.eswa.2022.118715

Rattay, P., Michalski, N., Domanska, O. M., Kaltwasser, A., De Bock, F., Wieler, L. H., & Jordan, S. (2021). Differences in risk perception, knowledge and protective behaviour regarding COVID-19 by education level among women and men in Germany. Results from the COVID-19 Snapshot Monitoring (COSMO) study. *PLOS ONE*, *16*(5), 1–26. https://doi.org/10.1371/journal.pone.0251694

Raude, J., Lecrique, J. M., Lasbeur, L., Leon, C., Guignard, R., Du Roscoät, E., & Arwidson, P. (2020). Determinants of Preventive Behaviors in Response to the COVID-19 Pandemic in France: Comparing the Sociocultural, Psychosocial, and Social Cognitive Explanations. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.584500

Ravert, R. D., Fu, L. Y., & Zimet, G. D. (2021). Young Adults' COVID-19 Testing Intentions: The Role of Health Beliefs and Anticipated Regret. *Journal of Adolescent Health*, *68*(3), 460–463. https://doi.org/10.1016/j.jadohealth.2020.12.001

RIVM. (2021a, May). Draagvlak voor de maatregelen. Retrieved June 11, 2021, from https://www.rivm.nl/gedragsonderzoek/maatregelen-welbevinden/draagvlak

RIVM. (2021b, November 10). Resultaten 11e ronde: Verklaringen gedrag. Retrieved September 8, 2023, from https://www.rivm.nl/gedragsonderzoek/maatregelen-welbevinden/resultaten-11e-ronde-gedragsonderzoek/verklaringen-gedrag

RIVM. (2021c, December 10). Resultaten onderzoek gedragsregels en welbevinden. Retrieved December 13, 2021, from https://www.rivm.nl/gedragsonderzoek/maatregelen-welbevinden

RIVM. (2022, April 15). Varianten van het coronavirus SARS-CoV-2. Retrieved April 20, 2022, from https://www.rivm.nl/coronavirus-covid-19/virus/varianten

RIVM. (2023, July 17). Naleving van en draagvlak voor de basis gedragsregels. Retrieved September 8, 2023, from https://www.rivm.nl/gedragsonderzoek/trendonderzoek

Sallam, M. (2021). COVID-19 Vaccine hesitancy Worldwide: A Concise Systematic Review of vaccine acceptance rates. *Vaccines*, *9*(2), 160. https://doi.org/10.3390/vaccines9020160

Sandberg, T., & Conner, M. (2008). Anticipated regret as an additional predictor in the theory of planned behaviour: A meta-analysis. *British Journal of Social Psychology*, *47*(4), 589–606. https://doi.org/10.1348/014466607x258704

Shanka, M. S., & Gebremariam Kotecho, M. (2021). Combining rationality with morality – integrating theory of planned behavior with norm activation theory to explain compliance with COVID-19 prevention guidelines. *Psychology, Health & Medicine*, 1–11. https://doi.org/10.1080/13548506.2021.1946571

Shmueli, L. (2021). Predicting intention to receive COVID-19 vaccine among the general population using the health belief model and the theory of planned behavior model. *BMC Public Health*, *21*(1), 1–13. https://doi.org/10.1186/s12889-021-10816-7

Solomou, I., & Constantinidou, F. (2020). Prevalence and Predictors of Anxiety and Depression Symptoms during the COVID-19 Pandemic and Compliance with Precautionary Measures: Age and Sex Matter. *International Journal of Environmental Research and Public Health*, *17*(14), 4924. https://doi.org/10.3390/ijerph17144924

Stolow, J., Moses, L. M., Lederer, A. M., & Carter, R. (2020). How fear appeal approaches in COVID-19 health communication may be harming the global community. *Health Education & Behavior*, *47*(4), 531–535. https://doi.org/10.1177/1090198120935073

Tannenbaum, M. B., Hepler, J., Zimmerman, R. S., Saul, L., Jacobs, S., Wilson, K., & Albarracín, D. (2015). Appealing to fear: A meta-analysis of fear appeal effectiveness and theories. *Psychological Bulletin*, *141*(6), 1178–1204. https://doi.org/10.1037/a0039729

trust. (2024). In *Cambridge Dictionary*. Retrieved January 15, 2024, from https://dictionary.cambridge.org/nl/woordenboek/engels/trust

V. Leary, A., D. Dvorak, R., N. De Leon, A., Peterson, R., & Troop-Gordon, W. (2020). Social Distancing During the COVID-19 Pandemic: Normative Interventions and Correlates of Social Distancing. *University of Central Florida & Auburn University*. Retrieved September 8, 2023, from https://europepmc.org/article/ppr/ppr327108

WHO. (2021, October 1). Advice for the public: Coronavirus disease (COVID-19). Retrieved December 6, 2021, from https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public

WHO. (2020, December 23). Coronavirus disease (COVID-19): How is it transmitted? Retrieved February 4, 2022, from https://www.who.int/news-room/questions-and-answers/item/coronavirus-disease-covid-19-how-is-it-transmitted

Wolff, K. (2021). COVID-19 Vaccination Intentions: The Theory of Planned Behavior, Optimistic Bias, and Anticipated Regret. *Frontiers in Psychology*, *12*, 1–7. https://doi.org/10.3389/fpsyg.2021.648289

Wong, C. M. L., & Jensen, O. (2020). The paradox of trust: perceived risk and public compliance during the COVID-19 pandemic in Singapore. *Journal of Risk Research*, *23*(7–8), 1021–1030. https://doi.org/10.1080/13669877.2020.1756386

Yasa, N. N. K., Piartrini, P. S., Telagawathi, N. L. W. S., Muna, N., Rahmayanti, P. L. D., Wardana, M. A., . . . Suartina, I. W. (2022). The role of attitude to mediate the effect of trust, perceived behavior control, subjective norm and per-ceived quality on intention to reuse the COVID-19 website. *International Journal of Data and Network Science*, *6*(3), 895–904. https://doi.org/10.5267/j.ijdns.2022.2.007

Yu, Y., Lau, J. T. F., & Lau, M. M. C. (2021). Levels and factors of social and physical distancing based on the Theory of Planned Behavior during the COVID-19 pandemic

among Chinese adults. *Translational Behavioral Medicine*, *11*(5), 1–8. https://doi.org/10.1093/tbm/ibaa146

Zeelenberg, M. (1999). Anticipated regret, expected feedback and behavioral decision making. *Journal of Behavioral Decision Making*, *12*(2), 93–106. https://doi.org/10.1002/(SICI)1099-0771(199906

Appendix

Appendix A

Survey Scenario

Imagine that in September, a new variant of the coronavirus emerges. How would you respond to the following questions based on the scenario outlined below?

It is early September, and a new unknown corona variant emerges, the Poseidon variant. This variant is as contagious as Omicron but appears to have stronger negative health effects than the Omicron variant. The likelihood of getting infected with this new variant is high, and if infected, you could become very ill. When vulnerable individuals such as the elderly contract the Poseidon variant, there is a high chance they will need to be hospitalized. The mortality rate among the elderly is relatively high. Your last vaccination (BioNTech, Pfizer) was in June, and new vaccination/booster rounds are set to begin in two weeks. The government decides to hold a press conference every two weeks to discuss the latest developments. Additionally, the government shares information about the virus, such as the infection rate, contagiousness, symptoms, and mortality rates.

To keep pressure on healthcare as low as possible and to prevent the spread as much as possible, the government implements the following measures.

- Everyone should stay at home as much as possible,
- A mask mandate applies to all public places such as shops and public transportation,
- Everyone must maintain one-and-a-half meters form each other,
- The government requires you to adhere to hygiene regulations such as washing hands frequently, sneezing in your elbow, and ensuring fresh air in the house,
- In case of covid-related symptoms, you must stay at home and take a self-test,

The government advises you to get a vaccination/booster shot.

Appendix B

Informed consent

You have been invited to participated in a research study titled "Exploring Psychological Determinants of Adherence to COVID-19 Restriction Measures: A Study Utilizing the Theory of Planned Behaviour, Anticipated Regret and Trust." This study is conducted by Yvo Noltes, from the Faculty of Behavioural, Management, and Social Sciences at the University of Twente.

The purpose of this research is to gain insight into people's behaviour regarding preventive COVID-19 measures. Completing the survey will take approximately ten minutes. The data from the survey will be used to determine which psychological factors influence people's behaviour related to COVID-19 measures, aiming to better understand human actions.

Your participation in this research is entirely voluntary and anonymous. You can withdraw at any time, and you are also free to leave questions unanswered.

I believe that there are no direct risks associated with this research, but as with any online activity, there is a possibility of data loss or a data breach. I will minimize any risks by not collecting information (such as IP addresses and location data) that can be traced back to an individual. The answers you provide in this research are therefore completely anonymous. If personal information is inadvertently provided in an answer, I will either remove it or ensure that it is anonymized. It is possible that I may use quotes form the survey in my research. These quotes, like all other responses, will not be traceable to an individual.

If you have any questions after completing the survey, you can contact me using the contact information provided below. If you are interested in the results of my research, please also reach out to me, and I will ensure that you receive a copy of the study.

Thank you!

Yvo Noltes
y.noltes@student.utwente.nl

Appendix C

Factor matrix

Factor Matrix Intentions

	Factor
	1
I intent to:	
adhere to the corona measures,	.88
keep 1.5-meter distance from others,	.79
wear a mouth mask where necessary,	.91
stay at home when I have corona-related symptoms,	.72
wash my hands often,	.66
sneeze in my elbow,	.66
do a self-test in case of corona-related symptoms,	.75
get a vaccine/booster shot.	.67

Factor Matrix Attitude UOM

	Factor
	1
I think that:	
an infection with the Poseidon variant could have serious health consequences,	.85
I could become very ill from the Poseidon variant,	.71
the measures will help against the spread of the Poseidon variant,	.75
it is important to implement the preventive measures against the spread of the Poseidon variant.	.75

Factor Matrix Overall trust in vaccination programs

	Factor
	1
I have confidence in the:	
safety of the current corona vaccine,	.81
effectiveness of the current corona vaccine,	.81
competence of pharmaceutical organisations in developing a safe corona vaccine,	.78
competence of the government in controlling the new corona outbreak,	.83
information the authorities will provide on the new corona outbreak,	.83
decisions taken by the authorities to deal with the corona outbreak,	.84
ability of the authorities to deal with the crisis adequately.	.84

Factor Matrix Anticipated regret

	Factor
	1
I think I would regret it, if in the month September, by my behaviour I:	
I pass on the virus to someone else,	.89
contract corona and get sick as a result,	.74
cannot participate in leisure activities because I contracted corona,	.76
infected a family member who got very sick from it,	.87
led me to be addressed for not adhering to corona measures,	.65
infected someone important to me with the new corona virus.	.89

Factor Matrix Subjective norms

	Factor
	1
People who are important to me would;	
think I should comply with the preventive corona measures,	.84
support my decision to stick to the measures,	.66
disapprove if I did not adhere to the preventive corona measures,	.80
think I should get vaccinated,	.71
agree with the government's corona policy.	.74

Factor Matrix PBC Control over getting infected

	Factor
	1
I can avoid:	
getting infected with the new Poseidon variant,	.79
infecting others with the new Poseidon variant.	.79

Factor Matrix PBC actual preventive behaviour

	Factor
	1
I am able to:	
get a vaccine or follow-up shot,	.64
avoid encounters with acquaintances as much as possible,	.75
avoid places where there are many people,	.74
keep 1.5 meters of distance,	.61
wear a face mask,	.89
wash hands often.	.77

Appendix D

Sobel test

Coefficients

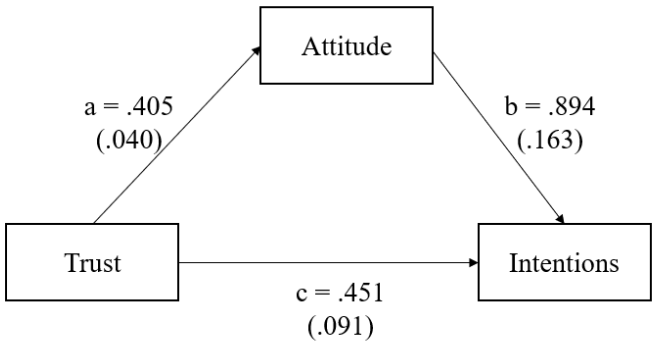
Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	8.27	0.85		9.72	<.001
	Overall Trust Vaccination Programms	**0.41**	**0.04**	.72	10.20	<.001

Note. Dependent Variable: Attitude UOM Poseidon

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	5.18	1.91		2.72	.008
	Overall Trust Vac. Programms*.	0.45	0.09	.42	4.95	<.001
	Att. UOM Poseidon**	**0.89**	**0.16**	.47	5.50	<.001

Note. Dependent Variable: Intentions. *Overall Trust in Vaccination Programms. **Attitude Usefulness preventive Measures Poseidon.



Input:			Test statistic:	Std. Error:	*p*-value:
a	.405	Sobel test:	4.82256238	0.07507834	0.00000142
b	.894	Aroian test:	4.80447958	0.07536092	0.00000155
s_a	.040	Goodman test:	4.8408509	0.0747947	0.00000129
s_b	.163	Reset all	Calculate		

Bron Sobel test: (J. Preacher, 2024).

Appendix E

Demographic variables

Intentions: Gender

		I intent to comply with preventive covid measures				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Gender	Male	14%	10%	19%	44%	14%
	Female	6%	10%	21%	42%	21%

Intentions: Age

		I intent to comply with preventive covid measures				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Age	<= 30	8%	16%	14%	45%	16%
	31 - 50	12%	6%	27%	36%	18%
	51+	11%	0%	22%	50%	17%

PBC over actual preventive behaviour

		I can avoid meetings with acquaintances				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Gender	Male	10%	39%	18%	27%	6%
	Female	7%	15%	15%	50%	13%

PBC over actual preventive behaviour

		I am able to get a vaccine of follow-up shot				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Gender	Male	10%	6%	18%	48%	18%
	Female	13%	4%	26%	28%	28%