Exploring the Behavioral Intention of Vaccination against COVID-19 Using the Theory of Planned Behavior

Fen-Fen Huang* and Yi-Horng Lai

***Abstract*—People's attitudes towards vaccines and beliefs about infectious disease prevention are closely related to the design and effectiveness of prevention strategies. This study explores Taiwanese people's views on COVID-19 vaccines, beliefs about infectious disease prevention, and people's acceptance of vaccinations extent and influencing factors. This study is mainly aimed at the people in the Greater Taipei area as the research subject. The convenience sampling method is used to investigate the willingness of the people to receive the new coronary pneumonia vaccine. The relevant data is collected through the google online questionnaire. The study found that people's attitudes, subjective norms, perceived behavioral control and behavioral intentions, social trust, health awareness, and expected emotions towards vaccination against COVID-19 were partially significant due to demographic variables. People's attitudes, subjective norms, and perceived behavioral control have positive effects on behavioral intentions.**

***Index Terms*—Behavioral intention, COVID-19, theory of planned behavior (TPB)**

I. Introduction

COVID-19 has caused serious illness or death to the public and consumed a large number of medical resources. Currently, the most effective way to prevent COVID-19 is vaccination, which reduces the chance of serious illness and death from complications. Currently, the vaccination rate for COVID-19 in Taiwan is gradually increasing. The Central Epidemic Command Center, Nation Health Command Center (CECC) recommends vaccinations to prevent the COVID-19 [1]. Therefore, by understanding the current vaccination status ofTaiwanese, it is possible to track changes in vaccination and compare the use of medical resources over a long period of time. Detecting differences in vaccine use can form better health policies, improve people's health, and make rational use of limited medical resources.

The purpose of this study is to explore the current situation of the demographic characteristics of the research subjects on the cognition, attitude, and willingness to administer the vaccine to COVID-19. To explore the willingness to vaccinate among regions and different age groups, and whether there are significant differences in the intention to vaccinate against COVID-19. Exploring the relationship between the attitude, subjective norm and perceived behavioral control of the subjects and their willingness to administer vaccine.

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II. Literature Review

A. COVID-19

When pneumonia of unknown cause occurred in Wuhan in December 2019, most of the cases went to the Huanan Seafood Market, which sells game. Although SARS-CoV-2 has been detected in environmental samples from this market, the source of infection and the route of transmission are unclear. In addition, from the epidemic investigation and laboratory testing of confirmed cases, it is known that through close-range droplets, direct or indirect contact with virus-bearing oral and nasal secretions, or prolonged contact within 2 meters of confirmed patients without respiratory protection in confined spaces, the risk of human-to-human transmission increases [2].

The clinical manifestations of known confirmed cases of COVID-19 include fever, dry cough, fatigue, and shortness of breath in about one-third. Other symptoms include muscle pain, headache, sore throat, diarrhea, etc. In some cases, the sense of smell or taste is lost (or abnormal). According to the epidemic information, most patients can recover, and a few patients will progress to severe pneumonia, respiratory distress syndrome or multiple organ failure, shock, etc., and will also die. Most of the deaths had underlying medical histories, such as diabetes, chronic liver disease, renal insufficiency, and cardiovascular disease. About 14% of severe symptoms required hospitalization and oxygen therapy, and 5% required intensive care unit treatment, the report said [3].

B. Factors Affecting the Administration of COVID-19 Vaccine

Temperature is a serious factor in the delivery of COVID-19 vaccines. The BNT vaccine is strictly stored and needs to be stored at minus 70 degrees, and it can only be administered within 3-5 days after thawing; the Moderna vaccine can be stored for 6 months at minus 20 degrees, and it is shortened to 30 days at 2 degrees; and the AZ vaccine can be stored according to the existing refrigeration equipment in the hospital; the Johnson & Johnson vaccine and Novavax and high-end vaccines can be stored at a higher temperature at 2

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to 8 °C without freezing [4].

For the COVID-19 vaccine, the World Health Organization (WHO) published standards in April 2020, suggesting that the minimum standard should have a 50% preventive effect and a 6-month protection period. The U.S. Food and Drug Administration (FDA) released the emergency use authorization (EUA) safety and efficacy data in October 2020, and requires manufacturers to have at least three interim reports, at least half of those who have completed the vaccination have a follow-up of more than 2 months [4].

C. Planned Behavior Theory

Based on the rational behavior theory, the behavior control belief (PBC) representing other irrational factors is added to the original theoretical framework, and the planned behavior theory is proposed. Because the rational action theory assumes that the main decision of behavior is behavioral intention, the successful explanation of this theory depends on the degree of will control, and the individual's action is under a great degree of control. Rational action theory's prediction of behavior becomes weak in uncontrollable circumstances. Therefore, behavior is often affected by many non-willpower factors, such as resources, opportunities, obstacles, and other factors. Relatively speaking, human behavior is not entirely determined by self-will. Ajzen (1989) added "perceptual behavior control" to rational action theory. The occurrence of behavior is based on individual will control. When some non-will factors have a strong influence on behavior, rational action theory can predict and explain behavior. TPB mainly explain that the factors affecting behavior intention include behavior attitude, behavior subjective norm and behavior control perception [5].

Theory of Planned Behavior (TPB) mainly analyzes the formation process of behavior patterns in three stages (Ajzen, 2002), (1) Behavior depends on individual intentions. (2) Intention is influenced by attitude, subjective norm, and cognitive behavioral control. (3) Attitudes, subjective norms, and perceived behavioral control are controlled by behavioral beliefs [6].

III. Research Method

This study is mainly aimed at the people in the Greater Taipei area as the research subject. The convenience sampling method is used to investigate the willingness of the people to receive the new coronary pneumonia vaccine. The relevant data is collected through the google online questionnaire. The distribution time is from July 1 to 21, 2021. During this period, the level 3 alert was extended, and the epidemic situation in Taiwan has slowed down somewhat. Due to insufficient doses of vaccines, only limited people are available. A total of 242 questionnaires were returned. Based on the theory of planning behavior (TPB) proposed by Ajzen (1985), this study investigates people's cognition, behavioral attitudes towards the new coronavirus vaccine, and related factors that affect people's vaccination, so as to understand people's Willingness to vaccinate. There are 44 questions in the questionnaire, which are mainly divided into eight parts. The first part consists of 11 questions on “population variables”, the second part consists of 8 questions on “behavior and attitude towards COVID-19 vaccine”, and the third part is “subjective norm of vaccination against COVID-19”. “5 questions, the fourth part is “Perceived behavior control of COVID-19 vaccine” 6 questions, the fifth part is “behavioral intention of COVID-19 vaccination” 5 questions, the sixth part is “health awareness” 3 questions, the seventh The part consists of 3 questions on “social trust”, and the eighth part consists of 3 questions on "expected emotions”. This study uses Likert's five-point scale as a measure, including “strongly agree”, “agree”, “average”, "disagree” and “strongly disagree”, with equally spaced scores. (5, 4, 3, 2, 1), the higher the score, the higher the agree level of item.

The research hypotheses are as follows: 1. Effects of different demographic variables on health awareness, social trust, expected emotions, attitudes, subjective norms, perceived behavioral control, and behavioral intentions. 2. The more positive the behavioral attitude of getting the Covid-19 vaccine, the higher the behavioral intention of getting the Covid-19 vaccine. 3. The more positive the subjective norm of getting the Covid-19 vaccine, the higher the behavioral intention of getting the Covid-19 vaccine. 4. The more positive the perception-behavioral control of getting the Covid-19 vaccine, the higher the behavioral intention of getting the Covid-19 vaccine. 5. The more positive the health awareness of getting the Covid-19 vaccine, the higher the behavioral intention of getting the Covid-19 vaccine. 6. The more positive the social trust in getting the Covid-19 vaccine, the higher the behavioral intention of getting the Covid-19 vaccine. 7. The more positive the anticipatory mood of getting the Covid-19 vaccine, the higher the behavioral intention of getting the Covid-19 vaccine.

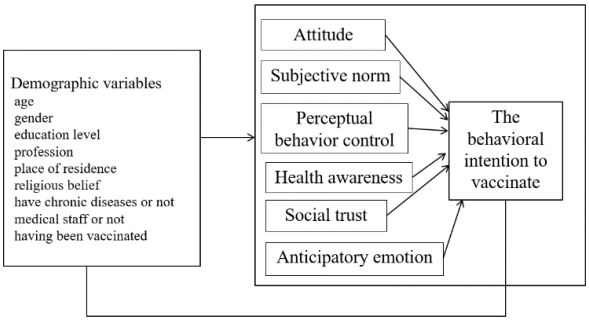

Fig. 1. Research framework.

In this study, independent samples t-test and One-way ANOVA were used to analyze demographic variables such as age, gender, education level, occupation, place of residence, religious belief, chronic disease, medical staff, vaccination, and various study variables. The differences were compared using the Scheffe method. Pearson-moment correlation analysis was used to test the degree of correlation between continuous variables to prove whether there was a significant correlation, and to test whether there was a high degree of collinearity between independent variables. Logistic multiple regression analysis was used to test the explanatory power of each independent variable for the dependent variable. Multiple Regression Analysis was used to study the explanatory and predictive power of background variables, attitude, subjective norm, and cognitive behavioral control on behavioral intention of vaccination. Before performing the multiple regression analysis, perform the collinearity

diagnostics to understand whether there is a high linear correlation between the predictors. When the diagnostic results showed that none of the independent variables were highly collinear, a multiple regression analysis was performed. The research framework is as follows:

IV. Results

A. The Distribution of the Background Variables of the Research Subject

There was a total of 242 valid questionnaires. In terms of age group, the age group was 18-29 years old, accounting for 35.1% of the total sample. In terms of gender, there are more women, accounting for 61.6% of the total sample. In terms of education level, the most are universities, accounting for 64.5% of the total number of samples. In terms of occupations, business is the most common, accounting for 36% of the total sample. In terms of residence, New Taipei City has the highest proportion, accounting for 57.4% of the total sample. In terms of religious beliefs, those with religious beliefs accounted for 35.1%, and those without religious beliefs accounted for 64.9%. In terms of whether they have chronic diseases, 17.8% have chronic diseases, and 82.2% have no chronic diseases. In terms of whether they are medical staff, 10.7% are medical staff and 89.3% are not medical staff. In terms of whether to be vaccinated, 26.9% were vaccinated, and 73.1% were not vaccinated.

TABLE I: Scale Reliability Analysis

Dimension	Cronbach'sα	Items
attitude	0.887	8
subjective norm	0.890	5
perceptual behavioral control	0.815	6
Health awareness	0.856	5
social trust	0.712	3
anticipatory emotion	0.806	3
behavioral intent	0.890	5

B. Inferential Statistics

The study found that people's attitudes, subjective norms, perceived behavioral control and behavioral intentions, social trust, health awareness, and expected emotions towards vaccination against COVID-19 were partially significant due to demographic variables. People's attitudes, subjective norms, and perceived behavioral control have positive effects on behavioral intentions. The relevant statistics are as follows:

TABLE II: One-Way Anova for Age and Other Variables

	18–29(1)	30–39(2)	40–49(3)	50–59(4)	60 above (5)	F–value	P–value	Post hoc
ATTITUDES	4.0868	4.3367	4.2756	4.3438	4.1477	2.397	0.051	
SUBJECTIVE NORM	3.8282	3.8694	4.0872	3.9778	4.1394	1.469	0.212	
PERCEPTUAL BEHAVIOR CONTROL	4.3471	4.5476	4.3376	4.4583	4.3081	2.029	0.091	
HEALTH AWARENESS	4.4667	4.5578	4.4786	4.4537	4.3636	2.029	0.574	
SOCIAL TRUST	4.4902	4.5442	4.4872	4.6111	4.4343	0.629	0.642	
ANTICIPATORY EMOTION	4.2471	4.1224	4.2479	4.213	4.2727	0.387	0.818	
BEHAVIORAL INTENTION	4.08	4.4327	4.3077	4.3278	4.2727	3.142	0.015	2>1

TABLE III: Regression Analysis

variable	Unstandardized coefficient		Standardized coefficient	*t*-value	*p*-value	*R*-square
	B	standard error	*β*			
constant	0.146	0.240		0.610	0.542	0.703
attitudes	0.506	0.064	0.473	7.865	<.001	
subjective norm	0.184	0.037	0.236	4.962	<.001	
perceptual behavior control	0.290	0.069	0.231	4.181	<.001	
health awareness	0.109	0.055	0.092	1.989	0.048	
social trust	–0.017	0.053	–0.014	–0.321	0.748	
anticipatory emotion	–0.103	0.039	–0.110	–2.668	0.008	

V. Discussion

The study only surveyed respondents' willingness to vaccinate and did not really measure respondents' vaccination behavior. Although past studies have found a high correlation between behavioral intentions and true behaviors, whether behavioral intentions can fully reflect true behaviors still debatable, and this part can also be used as a further discussion on the research on the COVID-19 vaccine in the future. The research suggests that the behavioral pattern of the public in administering vaccines during special epidemic prevention periods can be explored from the perspective of the public, such as the behavioral pattern of health beliefs, in order to strengthen the effectiveness of vaccine administration. From the perspective of government health education policies and public relations measures, including policy packaging or policy marketing research, in order to improve the public's epidemic prevention, when various government agencies promote measures that are closely related to the public or need to be comprehensively promoted, can improve public acceptance and judgment, so as to reduce the influence of non-objective media reports.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Fen-Fen Huang designed the study and wrote the research protocol, as well as the drafting and revision of the paper. Yi-Horng Lai were involved in the conception, design, analysis, and interpretation of the data.

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