

Using the Theory of Planned Behavior to Understand Athletes' Behavioral Intention of COVID-19 Vaccination

Lin, Jan-Wei

Center for General Education Sports Administrative Organization, National Chi Nan University, Taiwan

Abstract

Introduction: The study aims to explore the antecedents of college athletes' behavioral intentions of COVID-19 vaccination in China based on the theory of planned behavior. **Method:** A quantitative approach was used to address the issue of the present study. Researchers developed the questionnaire, and purposive sampling was adopted to select respondents who are members of the varsity sports team. An online questionnaire was utilized to collect data. Descriptive analysis and structural equation modeling partial least squares were used to analyze the collected data. **Results:** (1) The findings indicate that college athletes' perceived attitudes, subject norms, and perceived behavior control toward COVID-19 vaccination significantly affect their behavioral intention of immunization. Attitude is the most crucial antecedent affecting college athletes' behavioral intention of immunization. The explanatory power of the model is 71.8%. **Conclusion:** College athletes' positive psychological status and knowledge would promote the vaccination attitude, which is the key to enhancing their vaccination behavior.

Keywords: Structural Equation Modeling, perceived attitudes, subject norms, perceived behavior.

Corresponding author: Lin, Jan-Wei

Email: cwlin@ncnu.edu.tw

Introduction

Background

Sports events worldwide have been unprecedentedly impacted during the COVID-19 pandemic. Many sports competitions and training are suspended because anti-epidemic policies and regional lockdowns are conducted to stop coronavirus spread. The same situation has been encountered in China, where many sports events, including the Winter Olympics, Chinese Basketball Association (CBA), Basketball League, and Chinese Super League, have been postponed or suspended (China Central Television, 2020). As a result, sporting events have suffered severe financial crises without spectators. It causes economic damage to sports organizations and the government and causes a specific achievement loss for athletes (Nauright et al., 2020). Additionally, athletes may be prone to anxiety and stress that generates reduced sleep, decreased appetite, increased loneliness, and fear of losing the opportunity to attend sporting events in the COVID-19 context (Schinke et al., 2020). Therefore, vaccination is essential to restart sports events and athletes' training, the essential eligibility criteria for participation in sports competitions, and safe and practical training.

Previous studies have explored the factors influencing people's behavioral intentions of vaccination. Understanding the behavioral factors influencing vaccination can help enhance willingness to vaccinate and increase vaccination rates, reducing the risk of infection and severe illness. For example, Li and Li (2020) research shows that females' positive attitude and social support from others would significantly increase their behavioral intention of HPV vaccination in China. Ferrante et al. (2011) study finds that people's willingness to vaccinate against H1N1 influenza is related to their fears of the pandemic. The study results of Pareek and Pattison (2000) indicate that people's belief in vaccines instead of health concerns is the main factor affecting the low willingness to vaccinate in MMR. Accordingly, various factors influence the behavioral intention of vaccination. Also, divergent behavioral vaccination is revealed because of different vaccines (Baumgaertner et al., 2018; You et al., 2020) risks of infectious diseases (Baumgaertner et al., 2020) and regions (Abedin et al., 2021; Chew et al., 2021). The theory of planned behavior (TPB) has been widely used to explain the behavioral intention of vaccination across different vaccination issues (Xiao & Wong, 2020). For instance, college Students' sense of H1N1 vaccination (Agarwal, 2014) behavioral sense of HPV vaccination (Juraskova et al., 2012), pregnant women's behavioral intention of whooping cough

vaccination (Ryan et al., 2020) children's behavioral intention of MMR vaccination (Abhyankar et al., 2008) and mothers' behavioral intention of hepatitis A vaccination (Cha & Kim, 2019). TPB provides a comprehensive picture to understand the behavioral meaning of vaccination for various vaccine objects and epidemic diseases. However, there are few studies on college athletes' COVID-19 vaccination behaviors. This study adopts TPB as a foundation for understanding college athletes' behavioral intentions of vaccination during the pandemic.

Considering the impact of COVID-19 on sporting events and the research gap in college athletes' behavioral vaccination, this study can contribute to offering strategies for restarting events and training and addressing the issue by expanding the TPB model. The present study adds motivation, knowledge, and commitment as external variables to expand TPB and confirm the relationship between external variables and the TPB model.

Theory of planned behavior

The Reasonable Action (TRA) theory is widely used to explain behaviors under voluntary control. However, people's behaviors cannot be executed entirely whenever they are willing (Leone et al., 1999). Ajzen (1991) added the variable of perceived behavior control into the TRA and formed the theory of planned behavior (Theory of Planned Behavior; TPB). The TPB increases the power to predict human behaviors and breaks through the limitations of TRA (Ajzen, 1991). Attitude, subjective norm, and perceived behavioral control have become the three significant psychological variables that predict behavioral intention in the TPB (Fishbein & Ajzen, 1977). People's behavior is generated with high behavioral definition (Ajzen, 1991). TPB has been generally used to understand behavioral vaccination purposes for different epidemic diseases. Nonetheless, the antecedents influencing athletes' behavioral immunization intention against COVID-19 have yet to be explored. Thus, the present study extends the TPB to provide insight into athletes' vaccination behavior.

Attitude is the positive or negative psychological consequences of performing a specific behavior (Ajzen, 1991). Attitude has been proven to affect behavioral intention significantly (Fishbein & Ajzen, 1977). In the vaccination issue, many empirical studies have verified that attitudes can positively influence vaccination intention (Chu et al., 2021; Agarwal, 2014). For example, from young women's perspectives, Gerend & Shepherd (2012) found a positive correlation between attitudes and vaccination intentions against human papillomavirus. Therefore, in the study, attitude is athletes' positive or negative psychological status toward

COVID-19 behavioral vaccination intentions. The following hypothesis is proposed:

H1: Athletes' attitudes can significantly influence behavioral intentions of COVID-19 vaccination.

Subjective norm refers to people's specific behavioral intentions generated from influential social individuals' or groups' pressure to meet society's expectations (Ajzen, 1991; Venkatesh & Davi, 2000). However, previous studies found that subjective norms would not influence behavioral intention in the vaccination issues (Chau & Hu, 2001; Gopi & Ramayah, 2007; Lewis et al., 2003; Ramayah et al., 2003; Shmueli, 2021). For instance, Bouanani's (2020) study confirmed that subjective norms significantly affect pharmacists' behavioral intention regarding HPV vaccination. Contrarily, Tickner et al. (2010) found that subjective norm did not significantly affect parents' intention to take preschoolers for the Diphtheria Tetanus Pertussis vaccine. The relationship between subjective norm and behavioral intention of vaccination would result in differences because of different respondents and vaccination issues. Whether subjective norms can affect athletes' behavioral intentions of COVID-19 vaccination will be verified by this study. The hypothesis is proposed as follows:

H2: Subjective norms can significantly influence Athletes' behavioral intentions of COVID-19 vaccination.

Perceived behavioral control refers to the degree to which an individual perceives being able to control a particular behavior (Ajzen, 1991), that is, how challenging it is to perform the behavior. A high degree of perceived behavioral control means that people perceiving the uncontrollable factors to a specific behavior is diminutive, and the possibility of implementing behavioral intention is promoted. It also can trigger the actual behavior and result in the behavioral decision. Many studies have proved the causal relationship between perceived behavioral control and behavioral intention in vaccination (Gopi & Ramayah, 2007; Li & Li, 2020; Liu et al., 2020; Demir et al., 2019). A study conducted by Li and Li (2020) showed that women's behavioral intention toward human papillomavirus vaccination is significantly correlated to their perceived behavioral control. Perceived behavioral control in this study refers to an athlete's ability and confidence to accept the COVID-19 vaccination and tests its effect on athletes' behavioral intention of vaccination. The hypothesis is proposed as follows:

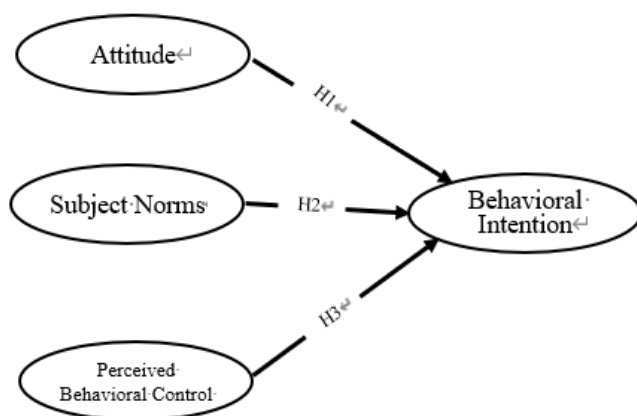
H3: Athletes' perceived behavioral control can significantly influence behavioral intentions of COVID-19 vaccination.

According to the literature review, this study adopts the TPB to explore the influence of

athletes' behavioral intention of COVID-19 vaccination. The research framework is shown in Figure 1.

Figure 1

Research framework



Methods

Research Design

This study explores the antecedents of college athletes' behavioral intention of vaccination in the COVID-19 context by the TPB model. Quantitative research was used to verify the model and address the study issue. The questionnaire was developed with relevant previous studies of TPB. The respondents were college athletes in China. The online questionnaire was adopted to collect data. The collected data was analyzed through structural equation modeling to test the validity and reliability of the scale and verify the TPB model.

Respondents

The purposive sampling was used to select college athletes from varsity sports teams in Mainland China. The online questionnaire was utilized as a research instrument, and the WJX online questionnaire platform (<https://www.wjx.cn/vj/YDYFPIw.aspx>) was used to collect data from 20 September to 20 October 2022. The researchers kindly invited coaches to assist with survey distribution to the athletes in the sports venues, including soccer, bodybuilding, taekwondo, swimming, basketball, volleyball, table tennis, badminton, track and field, gymnastics, and traditional martial arts. A total of one thousand and fifty online questionnaires were gathered. Sixty-nine invalid questionnaires were removed, including consistent, regular,

and incomplete answers. Finally, nine hundred eighty-one valid questionnaires were collected, and the correct response rate was 93.40%.

Measurement

The TPB items were constructed by Ajzen's (1991) definitions, encompassing attitudes (consisting of 5 items), subjective norms (comprising 4 items), perceived behavioral control (comprising 3 items), and behavioral intentions (consisting of 3 items), as delineated in Table 1. In this study, a 7-point Likert scale served as the standardized measurement tool, where responses ranged from "strongly agree" at 7 points to "strongly disagree" at 1 point. The second section of the questionnaire collected demographic information, encompassing gender, academic year, major, sports proficiency, residence, weekly training frequency, daily training sessions, training duration per session, COVID-19 infection history, vaccination behavior, and vaccine brand.

Table 1

The items of the extended TPB scale

Variables	Definition	Items
Attitude	Attitude is defined as the positive or negative psychological consequences of behavioral vaccination.	I think COVID-19 vaccination can : 1. effective anti-epidemic virus (A1) 2. proceed my training smoothly (A2) 3. maintain my health (A3) 4. resume the competition (A4)
Subjective norm	Athletes' behavioral intention of vaccination is generated by influential social individuals' or groups' pressure to meet society's expectations.	I have COVID-19 vaccination because (of) : 5. teammates are vaccinated (SN5) 6. coach are vaccinated (SN6) 7. other teams are vaccinated (SN7) 8. school/national epidemic prevention regulations (SN8)
Perceived behavioral control	The degree to which an athlete perceives being able to control vaccination.	I think COVID-19 vaccination/vaccine : 9. has little side-effect to me (PBC9) 10. is simple in the process (PBC10) 11. can be vaccinated at any institution (PBC11) 12. is smooth and fast in the process (PBC12)
Behavioral intention	An athlete's readiness to perform vaccination.	I will : 13. have a COVID-19 vaccination (BI13) 14. complete the COVID-19 booster shot (BI14) 15. vaccinate the required number of doses according to the epidemic prevention (BI15)

Data Analysis

The SPSS 22.0 statistics software was used to analyze demographics, behavioral vaccination, and the mean of the variables in the TPB by descriptive analysis. In addition,

Smart-PLS 3.0 was used to test the reliability and validity of the research scale and partial least squares structural equation modeling (PLS-SEM) to verify the TPB model upon college athletes' behavioral intention of COVID-19 vaccination.

Results

Demographic and Behavioral Vaccination

The respondents' demographics and behavioral vaccination results indicate that female athletes (54.30%) are slightly higher than male athletes (45.70%). Most athletes are freshmen (45.30%). More than half of athletes' major is in non-physical education (61.50%). Approximately 50.60% of athletes' sports expertise is taekwondo. Most athletes have accepted a vaccination (96.80%) and have never been infected with COVID-19 (98.90%). Many athletes train one day per week (24.80%) and 61-120 minutes per day (57.60%). The leading brand of vaccine selection is Sinovac Biotech (67.20%).

Reliability and Validity

The results of the descriptive analysis indicate that the mean scores of attitude ($M = 6.61$), subject norm ($M = 6.07$), perceived behavioral control ($M = 6.23$), and behavioral intention ($M = 6.63$) are higher than 6.00. Reliability and validity analysis results indicate that the factor loadings (FL) of the observed variables are all higher than 0.70, which means the observed variable is highly correlated with the latent variable and has good convergent validity. The Cronbach's alpha coefficient of all latent variables is more significant than 0.80, indicating that the latent variables have good internal consistency reliability. Furthermore, the construction reliability (CR) coefficients are all higher than 0.80, showing a high correlation between the observed variables. The average extraction variance (AVE) is above 0.60, meaning that more than 50% of the conflict is explained by the observed variables (Table 2). Finally, the square root of the AVE of all potential variables is higher than the correlation coefficients between the variables, indicating that the possible variables can be significantly distinguished. Accordingly, the model has good reliability and validity (Table 3).

Table 2*Reliability and validity*

Variables	Items	FL	M	Cronbach's α	CR	AVE
Attitude	A1	0.94	6.61	0.95	0.96	0.86
	A2	0.95				
	A3	0.92				
	A4	0.90				
Subject norm	SN5	0.90	6.07	0.90	0.93	0.76
	SN6	0.91				
	SN7	0.90				
	SN8	0.76				
Perceived behavioral control	PCB9	0.94	6.23	0.92	0.95	0.86
	PCB10	0.91				
	PCB11	0.93				
	PCB12	0.94				
Behavioral intention	IB13	0.96	6.63	0.93	0.96	0.88
	IB14	0.91				
	IB15	0.95				

Note: FL=Factor loading; M=Mean; CR= Construction reliability; AVE= Average extraction variance

Table 3*Discriminant analysis*

	SN	PBC	A	BI
SN	0.87			
PBC	0.61	0.93		
A	0.65	0.80	0.93	
BI	0.60	0.77	0.82	0.94

Note: A= Attitude; BI= Behavioral control; PBC= Perceived behavioral control; SN= Subject norm

Model Fit

Goodness-of-fit (GoF) is the essential model evaluation index for PLS-SEM. Akter et al. (2011) suggest that if the GoF is higher than 0.36, it means that the model has a high level of model fit; between 0.25 to 0.35 is a medium level of model fit; between 0.10 to 0.24 is acceptable; below 0.10 means the model fit is unacceptable. The formula of GoF is as follows:

$$\text{GoF} = \sqrt{\text{average AVE} \times \text{average } R^2}$$

The GoF of this study is calculated to be 0.7776, which means that the TPB model has a high model fit.

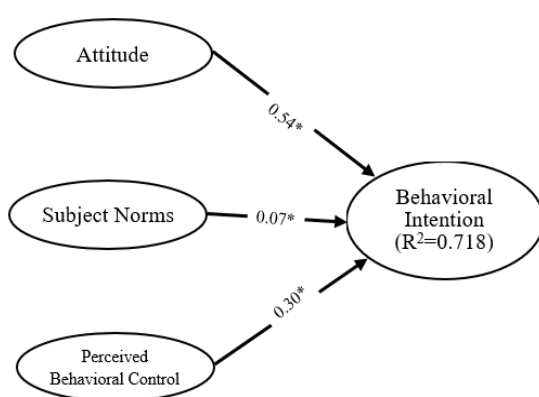
Structural Model Analysis

The results of structure model analysis reveal (Figure 2) that college athletes' attitudes (β

$= .54, p < .05$), subjective norm ($\beta = .07, p < .05$), perceived behavioral control ($\beta = .30, p < .05$) would significantly influence their behavioral intention of vaccination, attitude has the most significant effect on behavioral purpose of COVID-19 vaccination. Subjective norm has a relatively weak impact on the behavioral choice of COVID-19 vaccination. The TPB model can provide 71.80% explanatory power. Accordingly, the TPB model has a good explanation power for predicting the behavioral intention of COVID-19 vaccination.

Figure 2

The TPB model of behavioral COVID-19 vaccination



Discussion

This study used TPB to explore athletes' behavioral intentions of COVID-19 vaccination in China. The TPB has remarkable explanatory power for predicting athletes' behavioral intentions. This study found that improving attitude, subjective norms, and perceived behavioral control can benefit athletes' behavioral intent of COVID-19 vaccination. These findings are consistent with previous studies on vaccination behavior based on TPB (Chu et al., 2021; Liu et al., 2020; Shmueli, 2021). Athletes have a high behavioral intention of vaccination when they believe vaccines can promote health, maintain training, and participate in competitions. The results of this study are consistent with the findings of Indriani et al. (2019). Athletes' attitude is the primary determinant in the decision-making of COVID-19 vaccination. Therefore, increasing athletes' value and confidence in vaccines is vital to maintaining a positive attitude. Besides formulating vaccine regulation, strengthening athletes' positive attitudes and recognition of the vaccine through education and promotion is necessary.

The influence of teammates' and coaches' vaccination status and adherence to epidemic prevention regulations can exert pressure on athletes, affecting their behavioral intention to receive the COVID-19 vaccination. However, it is worth noting that the effect of subjective norms on athletes' behavioral immunization intention is relatively weak ($\beta=0.07^*$), although a statistically significant relationship exists. Cook and Hunt (2020) pointed out that athletes are highly autonomous, so they may be less susceptible to external influence. Therefore, significant others' influence on athletes' behavioral purposes warrants further examination and validation in future research. Exploring how athletes are influenced by their immediate social circles and the role of peers and authority figures in shaping their vaccination decisions could provide valuable insights into strategies for promoting vaccination in sports settings.

Additionally, the high perception of a simple vaccination process can enhance individuals' behavioral intention to receive COVID-19 vaccination. When individuals perceive the vaccination process as straightforward, convenient, and accessible, they are more likely to be motivated to get vaccinated (Tostrud et al., 2022). This perception of simplicity can reduce perceived barriers, such as time constraints or logistical difficulties, that deter individuals from getting vaccinated. Especially athletes, who often undergo intensive training and competitions. It plays a crucial role in promoting a positive attitude toward vaccination and increasing the likelihood that individuals will follow the vaccination process. Therefore, simplifying the vaccination procedure and ensuring clear communication about its ease can be an effective strategy to boost vaccination rates and contribute to Athletes' health efforts in combating COVID-19.

This study was designed with a rigorous process to understand athletes' behavioral intentions of COVID-19 vaccination. However, there are several research limitations for future research reference. First, the respondents of this study are college athletes in China. Therefore, it is limited to understanding other levels (i.e., professional and amateur) and countries of athletes' opinions of COVID-19 vaccination behavior. Especially in Europe, many athletes refuse COVID-19 vaccination, which leads to the athletes being rejected by competition from other countries. Therefore, a regional cross-comparison of athletes' behavioral immunization intentions from different countries is suggested in future studies. Understanding the differences in the behavioral choice of vaccination among countries' athletes can benefit the formulating policies of anti-COVID-19 for foreign athletes. Second, the study faces the limitation of human resources that causes the problem of uneven distribution among sports competitions. The study

suggests that working or asking sports associations for assistance with a questionnaire survey may improve the limitation. Third, the analysis is quantitative to verify the causal relationship between variables. However, the context of the causal relationship is limited. Thus, combining with the qualitative method is advised in future studies to enrich the findings and suggestions.

Conclusions

The study concludes that the TPB model can effectively explain athletes' behavioral intention of vaccination against COVID-19. The positive attitude, perceived subject norm, and perceived behavioral control can increase college athletes' behavioral intent of vaccination. Attitude is the most significant factor that affects athletes' behavioral intent of COVID-19 vaccination. It is worth noting that subjective norm significantly affects the behavioral purpose of vaccination. However, its effective coefficient is low. Future research can further identify the relationship between subjective norms and behavioral intention in vaccination issues.

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以計畫行為理論探討運動員對 COVID-19 疫苗接種之行為意向

林展緯

臺灣 國立暨南國際大學/通識教育中心體育組

摘要

緒論：本研究是基於計畫行為理論，探討中國大陸大學生運動員 COVID-19 疫苗接種行為意向的前因。**方法：**本研究採用了量化方法來解決當前研究的問題，研究人員發展相關問卷，並以大學運動代表隊的成員為研究對象，透過網絡問卷來收集數據，以描述性分析和結構方程模式來進行資料分析。**結果：**(一) 影響大學運動員接種疫苗行為意象的因素有對疫苗的知覺態度、主觀規範和知覺行為控制等面向。(二) 態度是影響大學運動員疫苗接種行為意向最關鍵的原因，該模型的解釋力為 71.8%。**結論：**大學運動員的積極心理狀態和知識將促進他們對疫苗的態度，這是增強他們接種行為的關鍵。

關鍵詞：結構方程模式、知覺態度、主觀規範、知覺行為