medical sciences forum

MDPI

Proceeding Paper

We Want Training and Competition! Extending the Theory of Planned Behavior to Understand Athletes' Behavioral Intention of Vaccination †

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† Presented at the the 2nd International Electronic Conference on Healthcare, 17 February–3 March 2022. Available online: https://iech2022.sciforum.net/.

Abstract: The purpose of the study is to explore the antecedents of college athletes' behavioral intention of vaccination in Mainland China based on the extended theory of planned behavior. Quantitative method 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. Online questionnaire (WJX.CN) was utilized to collect data; a total of 981 valid online questionnaires were recruited. Descriptive analysis and structural equation modeling partial least squares were used to analyze the collected data. The findings indicate that the college athletes' perceived attitudes, subject norms, and perceived behavior control toward vaccination significantly affect their behavioral intention of vaccination. Attitude is the most crucial antecedent affecting college athletes' behavioral intention of vaccination. Furthermore, the extended antecedents of commitment, motivation, and knowledge significantly influence college athletes' attitudes toward behavioral intention of vaccination. Attitude is a partial mediator between commitment, motivation, knowledge, and behavioral intention of vaccination. The explanatory power of the model is 71.8%. College athletes' positive psychological status and knowledge would promote the vaccination attitude, which is the key to enhancing their vaccination behavior.

Keywords: COVID-19 vaccine; college athletes; Mainland China; extended theory of planned behavior; vaccination

Citation: Deng, Q.; Ku, G.C.M. We Want Training and Competition! Extending the Theory of Planned Behavior to Understand Athletes' Behavioral Intention of Vaccination. *Med. Sci. Forum* **2022**, *2*, x. https://doi.org/10.3390/xxxxx

Academic Editor: Firstname Lastname

Published: date

1. Introduction

Sports events worldwide have been unprecedentedly impacted in the period of 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 Mainland China, where many sports events, including the Winter Olympics, Chinese Basketball Association (CBA) Basketball League, and Chinese Super League, have been postponed or suspended1. 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 certain achievement loss to the athletes2. Additionally, athletes may be prone to anxiety and stress that generate reduced sleep, decreased appetite, increased loneliness, and fear of losing the opportunity to attend sporting events in the COVID-19 context3. Therefore, vaccination is essential to restart sports events and athletes' training, the basic eligibility criteria for participation in sports competitions, and safe and effective training.

Previous studies have been devoted to exploring the factors that influence people's behavioral intentions of vaccination. Understanding the behavioral factors influencing

vaccination can help enhance willingness to vaccinate and increase vaccination rates, thereby reducing the risk of infection and severe illness. For example, Li and Li's4 research shows that females' positive attitude and social support from others would significantly increase their behavioral intention of HPV vaccination in China. Ferrante's 5study finds that people's willingness to get vaccinated against H1N1 influenza is related to their fears of the influenza pandemic. The study results of Pareek and Pattison6 indicate that the main factor affecting the low willingness to vaccinate in MMR is people's belief in vaccines instead of health concerns. Accordingly, there are various factors that influence the behavioral intention of vaccination. Also, divergent behavioral vaccination is revealed because of different vaccines7, 8, risks of infectious diseases 9, and regions10 11. The theory of planned behavior (TPB) has been widely used to explain the behavioral intention of vaccination across different vaccination issues12. For instance, college Students' intention of H1N1 vaccination13, behavioral intention of HPV vaccination14, pregnant women's behavioral intention of whooping cough vaccination15, children's behavioral intention of MMR vaccination16, and mothers' behavioral intention of hepatitis A vaccination17. TPB provides a comprehensive picture to understand behavioral intention 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 to understanding college athletes' behavioral intentions of vaccination in the pandemic context.

Although TPB can explain and predict behavioral vaccinations based on its solid fundament 18, the theory is still challenged its limitations in predicting behavioral intentions. Therefore, many studies have expanded TPB to increase the understanding of behavioral vaccination while exploring potential variables that affect attitudes or behavioral intention. As Catalano19 mentioned, TPB is a limited explanation for the behavioral intention of vaccination. The study should add other influential variables into TPB to complete the theoretical framework, i.e., health beliefs and acceptability of vaccines20, which can understand the critical factors of vaccination. Reviewing the expended TPB with additional variables on previous studies, including motivation21, knowledge22, commitment23, ethics24, and anticipated regret25. The additional variables of motivation26, knowledge27, commitment23, 28 indirectly significantly influence behavioral intention via attitude. Accordingly, this study attempts to combine athletes' motivation, knowledge, and commitment to vaccination with TPB model. The expended TPB model is expected to offer insight into college athletes' behavioral intentions of vaccination in the COVID-19 context.

In light of the impact of COVID-19 on sporting events and the research gap in college athletes' behavioral vaccination, this study can contribute to offering the strategies of restarting events and training and address 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.

2. Methods

2.1. Research Design

The purpose of this study is to explore the antecedents of college athletes' behavioral intention of vaccination in the COVID-19 context by expended TPB model. Quantitative research was used to verify the expended model and address the study issue. The questionnaire was developed with relevant previous studies of TPB. The respondents were college athletes in Mainland 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 expended TPB model.

2.2. Respondents

The purposive sampling was used to select college athletes who are varsity sports teams in Mainland China. The online questionnaire was utilized as a research instrument, and WJX online questionnaire platform (https://www.wjx.cn/vj/YDYFPIw.aspx) was used to collect data. A total of one thousand and fifty online questionnaires were gathered.

Sixty and nine invalid questionnaires were removed, including consistent, regular, and incomplete answers. Finally, nine hundred and eighty-nine valid questionnaires were collected, the response rate was 93.4%.

2.3. Measurement

Furthermore, the items of expanded variables of motivation (5 items) are based on Jang's 29 definition, while knowledge (4 items) is based on Zagzebski's 30 definition, and commitment (3 items) is based on Lokhorst's 31 definition. Overall the expended TPB scale contained twenty-seven items. This study used Likert's 7-point scale as the benchmark, the scale from "strongly agree" to "strongly disagree" represents 7 to 1 point, respectively. The second part of the questionnaire was demographic, including gender, grade, major, sport expertise, residence, number of training days per week, frequency of training per day, duration of training per time, the experience of infected with coronavirus, behavioral vaccination, and the band of the vaccine.

2.4. Ethical Consideration

College athletes filled out the questionnaires of this study. Their coaches guided the questionnaire survey. Before the questionnaires were distributed, the respondents' informed consent would be attached, and the researchers explained to the coaches the purpose of the study and the rights of the respondents in person. The coaches were asked to present to athletes that the questionnaire was only for academic purposes and never disclosed any personal information. The study adopted an anonymous survey and filled it out by personal willingness. The athletes have the right not to answer or withdraw from the questionnaire survey at any time. The explanations mentioned above were emphasized in informed consent to achieve the norms of academic research ethics.

2.5. Data Analysis

The SPSS22.0 statistics software was used to analyze demographic, behavioral vaccination, and the mean of the variables in expanded 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 expanded TPB model upon college athletes' behavioral intention of vaccination.

3. Results and Discussion

3.1. Demographic and Behavioral Vaccination

The respondents' demographic and behavioral vaccination results indicate that female athletes (54.3%) are slightly higher than male athletes (45.7%). The majority of athletes are freshmen (45.3%). More than half of athletes' major is in non-physical education (61.5%). Approximately 50.6% athletes' sport expertise is taekwondo. Most athletes have accepted a vaccination (96.8%) and never infected COVID-19 (98.9%). Many athletes are training one day per week (24.8%) and 61-120 minutes per day (57.6%). The main brand of vaccine selection is Sinovac Biotech (67.2%)

3.2. Reliability and Validity

The mean scores of motivation(M=6.480), knowledge(M=6.149), commitment(M=6.552), attitude(M=6.606), subject norm(M=6.074), perceived behavioral control(M=6.074), and behavioral intention(M=6.628) are higher than 6.000. The results of reliability and validity analysis indicate that the factor loadings of the observed variables are all higher than 0.700, which means observed variable is highly correlated with the latent variable and has good convergent validity. The Cronbach's alpha coefficient of all latent variables is greater than 0.800, indicating that the latent variables have good internal consistency reliability. Furthermore, the construction reliability (C.R.) coefficients are all

higher than 0.800, indicating that there is a high correlation between the observed variables. The average extraction variance (AVE) is above 0.600, indicating that more than 50% of the variance explained by the observed variables. Finally, the square root of AVE of all potential variables are higher than the correlation coefficients between the variables, indicating that the potential variables can be significantly distinguished. Accordingly, the model has good reliability and validity.

3.3. Model Fit

Goodness-of-fit (GoF) is the essential model evaluation index for PLS-SEM. Akter32 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:

$$\text{GoF} = \sqrt{\text{average AVE} \times \text{average } R^2}, \quad (1)$$

The GoF of this study is calculated to be 0.791, which means that the expended TPB model has a high level of model fit.

3.4. Structural Model Analysis

The results of structure model analysis reveal (Figure 1) that college athletes' attitudes (β=0.538*; *p<0.05), subjective norm (β=0.068*; *p<0.05), perceived behavioral control (β=0.301*; *p<0.05) would significantly influence their behavioral intention of vaccination, attitude has the greatest effect on behavioral intention of vaccination. Furthermore, college athletes' commitment (β=0.559*; *p<0.05), motivation (β=0.299*; *p<0.05), and knowledge (β=0.110*; *p<0.05) have significant effect on attitude toward vaccination. Commitment is the most powerful influence on attitude. Of the indirect effect, college athletes' commitment (β=0.559*; *p<0.05), motivation (β=0.299*; *p<0.05), knowledge (β=0.110*; *p<0.05) can indirectly influence their behavioral intention of vaccination via attitude. The expended TPB model can provide 71.8% explanatory power to comprehend college athletes' behavioral intention of vaccination. Accordingly, the expended TPB model has a good explanation for the behavior of COVID-19 vaccination.

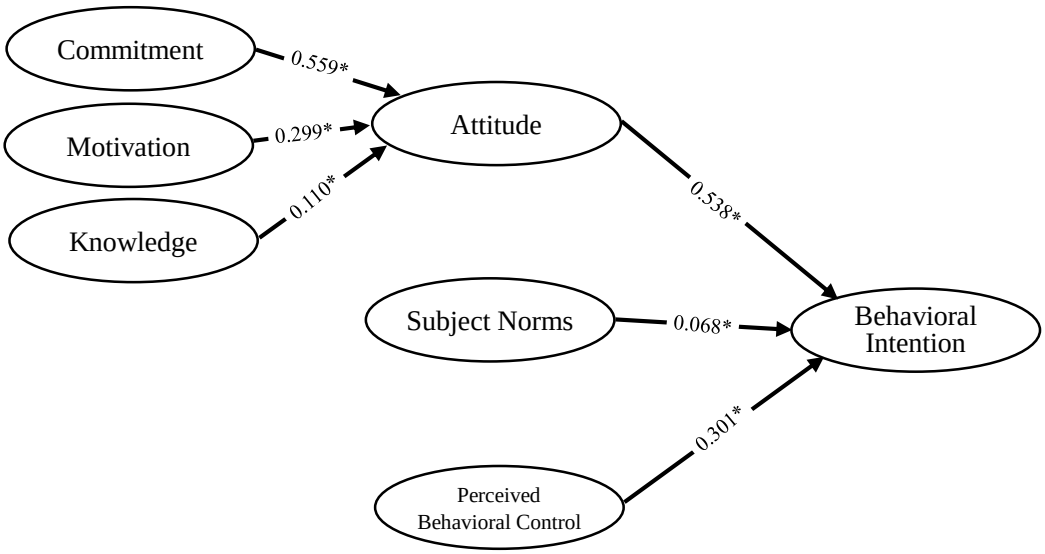

Figure 1. The expended TPB model of behavioral vaccination.

4. Conclusions

The study concludes that expended TPB model can effectively explain college athletes' behavioral vaccination against COVID-19. The positive attitude, perceived subject norm, and perceived behavioral control can increase college athletes' behavioral intention

of vaccination. Moreover, the great motivation, knowledge, and commitment would enhance college athletes' attitude toward vaccination. The attitude is the mediator between motivation, knowledge, commitment, and behavioral intention of vaccination. It is worth noting that although subjective norm has a significant effect on behavioral intention of vaccination. However, its effective power is low (β=0.068). Future research can further identify the level of relationship between subjective norm and behavioral intention of vaccination.

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