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The mediating roles of social benefits and social influence on the relationships between collectivism, power distance, and influenza vaccination among Hong Kong nurses: A cross-sectional study

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ABSTRACT

Background: Despite being recommended by many medical organizations, the uptake rates of seasonal influenza vaccination among healthcare workers, including nurses, are still unsatisfactory. Considering the impact of cultural values on organizational behaviors, vaccination among nurses may also be influenced by cultural values via their impacts on socially oriented motivation and the acceptance of social influence.
Objectives: This study examined whether and in what way two individual-level cultural dimensions, collectivism and power distance, would influence vaccination via social benefits (i.e., self-and-clan protection and community protection) and social influence (i.e., authority advice, and family-and-peer advice), respectively, among nurses.
Design: A cross-sectional online survey.
Setting: An invitation to participate in the survey was sent to nurses using the contact list of a professional nursing organization in Hong Kong and by personal referrals.
Participants: A total of 1386 nurses (mean age = 37.82, *SD* = 10.36; 89% women) completed the survey.
Methods: The survey included instruments on cultural values, perceived social benefits, and social influence, and questions regarding 2-year vaccination records. The mediation model was tested using structural equation modeling with bootstrapped samples. Subgroup analyses were conducted to examine whether the mediation paths were different across different levels of demographic factors.
Results: The structural paths in the mediation model were different between nurses that had been vaccinated in the past and those who had not. In the adoption model (i.e., for nurses non-vaccinated in the past), the positive effects of collectivism on vaccination were mediated by self-and-clan protection and authority advice, whereas the negative effect of collectivism on vaccination was mediated by community protection. In addition, the positive effect of power distance on vaccination was mediated by authority advice. In the maintenance model (i.e., for nurses vaccinated in the past), except for the positive effect of collectivism on vaccination via authority advice, the other indirect effects were not significant. The direct effect of collectivism on vaccination was negative, whereas the direct effect of power distance on vaccination was positive.
Conclusions: Collectivism and power distance may guide how nurses attend to and process social information and subsequently influence their vaccination adoption behaviors. More research is needed to examine how cultural dimensions may influence vaccination maintenance and the applicability of the current findings to other cultures.

What is already known about the topic?

- Cultural values influence organizational behaviors.
- Collectivism is associated with social motivation and citizenship behaviors.

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- Power distance is associated with social influence and social behaviors.

What this paper adds

- The results of this study showed that the associations between cultural values and vaccination adoption among nurses were mediated by perceived social benefits and social influence.
- Social benefits and social influence however could not explain the associations between the cultural dimensions and vaccination maintenance.

1. Introduction

According to the estimates of World Health Organization (2018), seasonal influenza causes 3–5 million cases of severe illness and up to 650,000 deaths per year. Healthcare workers including nurses are at a higher risk of acquiring influenza infection and spreading this to vulnerable patients due to their increased exposure (Weinstein et al., 2003). Despite the varied effectiveness of influenza vaccines which depends on how well they match the circulating viruses (Paules et al., 2018), it is recommended that healthcare workers take the seasonal influenza vaccines (Dash et al., 2004; Grohskopf et al., 2017; Talbot et al., 2010).

Most nurses work in healthcare settings such as hospitals, clinics, ambulatory services, and residential care facilities, with well-defined organizational structures. Considering its social benefits (Nagata et al., 2013; Yaqub et al., 2014), influenza vaccination can be considered a prosocial or organizational citizenship behavior, as it is voluntary and strongly recommended in many medical settings. Studies have shown that cultural values influence many organizational behaviors (Hu and Judge, 2017; Zhong et al., 2016). In this study, we examined whether and how the individual-level cultural values of collectivism and power distance might affect the uptake of influenza vaccination among nurses in Hong Kong.

1.1. Cultural values: collectivism and power distance

Hofstede identified six cultural value dimensions including individualism-collectivism, power distance, uncertainty avoidance, masculinity-femininity, long-term versus short-term orientation, and indulgence-restraint as a framework for cross-cultural comparisons in psychology, business, and communication (Hofstede, 2011). The individual differences in these cultural values have also been used to understand individuals' behaviors within a culture (Yoo et al., 2011). Among these value dimensions, collectivism (versus individualism) and power distance are considered the most important for differentiating between cultures and have important implications for social behaviors (Basabe and Ros, 2005; Schermerhorn and Bond, 1997).

Individualism refers to the preference toward a loosely bonded framework in a society, in which individuals are expected to only take care of themselves and their immediate family, whereas collectivism refers to the preference toward a tightly-knit social framework in which individuals are expected to give the group priority over individuals (Hofstede, 2003). Power distance refers to the extent to which the less powerful individuals of the social structures expect and accept that power is not distributed equally (Hofstede, 2003). Empirical evidence has supported the suggestion that organizational citizenship behaviors were associated with both collectivism (Cohen and Avrahami, 2006; Finkelstein, 2014; Moorman and Blakely, 1995) and power distance (Asgari et al., 2008). As vaccination can be conceptualized as a prosocial behavior, it was expected that nurses who were more collectivistic and power distance oriented were more likely to receive influenza vaccination.

1.2. Collectivism and social benefits of vaccination

Individuals who are more collectivistic are more inclined to identify themselves as citizens of their organizations and concerned for co-workers, meaning that they will perform more organizational citizenship behaviors (Finkelstein, 2010, 2012, 2014). In a study of volunteer process, social motives and volunteer identity were predictive of time spent volunteering; and collectivism, although having no direct effect on time spent volunteering, was associated with both social motives and volunteer identity (Finkelstein, 2010).

There are personal and social benefits of influenza vaccination for nurses. The personal benefit is apparently the prevention of influenza infection despite their high exposure to viruses in the healthcare settings. The social benefits include prevention of the spread of the virus to family members and friends, patients in the healthcare settings, as well as people in the greater community. We expect that nurses who are more collectivistic would be more likely to consider these social benefits as important, and hence be motivated to receive influenza vaccination.

1.3. Power distance and social influence on vaccination

Among individuals who are more power-distance oriented, their leaders or managers would have greater ability to influence the individuals' behaviors (Asgari et al., 2008). For instance, source credibility or source expertise (which are usually people of higher power) was found to have a stronger impact on persuasion (Pornpitakpan and Francis, 2000).

In most countries, influenza vaccination is voluntary for nurses. Power distance may have an impact on the decision to take the influenza vaccination via the advice given by people or organizations at different levels of power such as family members, coworkers, employers, professional organizations, work settings and government departments. Like source expertise, the higher the power of the source of advice, the more likely it would influence behaviors. Therefore, we expect that nurses who are more power distance oriented will be more likely to accept advice, and hence be motivated to take influenza vaccination.

1.4. Purpose of the study

We examined whether and how collectivism and power distance might influence influenza vaccination uptake among nurses in Hong Kong. In particular, we tested whether social benefits (i.e., perceived benefits toward different individuals or groups) and social influence (i.e., acceptance of advice from different sources) would mediate, respectively, the effects of collectivism and power distance on influenza vaccination among nurses. The theoretical constructs for the social benefits toward different individuals or groups and the social influence from different sources would be empirically derived in this study. Therefore, no specific hypotheses were formulated when designing the study. The conceptual model is shown in Fig. 1.

2. Methods

2.1. Participants and procedures

Employed nurses with professional qualifications recognized in Hong Kong or nursing students or trainees receiving training in

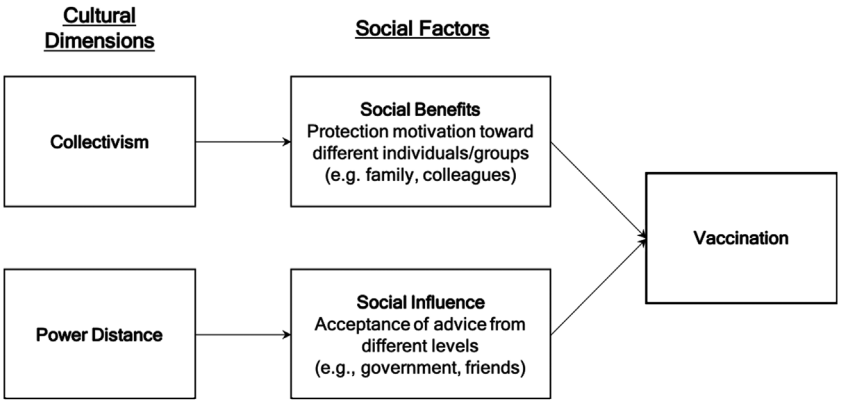

Fig. 1. The Proposed Mediation Model.

Hong Kong were eligible to participate in the Hong Kong Influenza Vaccine Survey among Nurses 2016/17 (VNHK1617). Assuming a logistic regression coefficient of 1.3, the vaccination coverage at 32%, alpha level at 5%, power at 90% and variance explained by other factors at 50%, the required sample size was 1436. Considering a rate of 20% for incomplete or invalid cases, the target sample size was set at 1795. Nursing students and nurses not currently employed accounted for only a small proportion of the sample, which limited the generalizability of the findings to these sub-populations. Therefore, only currently employed nurses were included to strengthen the generalizability of a more refined population.

A cross-sectional online survey was used in this study. An email invitation including a hyperlink of an online survey on seasonal influenza vaccination was sent to potential participants through the Association of Hong Kong Nursing Staff (AHKNS). The survey link was also distributed through personal referrals. The recruitment period was from February to April 2017. Informed consent was required on the first page of the survey. Participants provided their consents by clicking a button on this page. As a token of appreciation, participants were entitled to a HK$20 fast-food restaurant coupon upon successful completion of the survey. The online survey platform was deactivated when the target sample size was reached. The protocol of the study was approved by the Survey and Behavioral Research Ethics Committee of the Chinese University of Hong Kong (Ref. No.: 023-18).

2.2. Instruments

2.2.1. Predictor: power distance and collectivism

Two dimensions in the Individual Cultural Values Scale (CVSCALE) (Yoo et al., 2011) were adopted to measure power distance and collectivism at the individual level. Participants reported the extent to which they agreed with each of the five items on power distance (e.g., "People in higher positions should avoid social interaction with people in lower positions") and each of the six items on collectivism (e.g., "Individuals should sacrifice self-interest for the group"), respectively, on a five-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A higher score indicates a stronger value for the cultural dimensions. The internal consistency in this study was satisfactory for both power distance ($\alpha = .69$) and collectivism ($\alpha = .87$).

2.2.2. Mediator: social benefits

Social benefits were measured by five items adapted from previous studies (Hakim et al., 2011; Looijmans-van den Akker et al., 2009; Loulergue et al., 2009) for the purpose of this study. Participants reported the degree of importance to their consideration to receive the vaccination based on the following statements: 1) influenza vaccine reduces my risk of getting sick, 2) influenza vaccine reduces the risk of transmitting influenza virus to my family and friends, 3) influenza vaccine reduces the risk of transmitting virus to my colleagues, 4) influenza vaccine prevents an outbreak at my workplace, and 5) influenza vaccine prevents an outbreak in my country.

To determine the factor structure of the data in this study, an exploratory factor analysis using principal-axis factoring was conducted. A two-factor solution was supported by the results of a follow-up parallel analysis, which was used to determine the appropriate number of factors (O'Connor, 2000). For interpretation of the factor solution, a Promax rotation was used to achieve a simple structure. The first two items were more heavily loaded on factor 1 with factor loadings ranging from 0.75 to 0.77 and satisfactory internal consistency ($\alpha = .90$). The last two items were more heavily loaded on factor 2 with factor loadings ranging from 0.77 to 0.82 and satisfactory internal consistency ($\alpha = .92$). Item 3 was loaded on both factor 1 and factor 2 and was not included in the subscale scores. The factors were labeled as self-and-clan protection and community protection, respectively.

2.2.3. Mediator: social influence

To measure social influence on vaccination, participants reported the extent to which they agreed with six statements. The statements with the stem "I would get a flu shot if advised/instructed by" were adapted for the purpose of this study from a measure of cues to action (Cheney and John, 2013), with an expansion on the various power statuses of the influencing agents including 1) employer, 2) direct supervisor at the workplace, 3) professional bodies, 4) government, 5) family or friends, and 6) colleagues.

The results of a parallel analysis following a principal-axis factor analysis of the data in this study suggested a two-factor solution. Promax rotation was used for a better interpretation. The first factor, labelled as authority advice, included employer, direct supervisor, professional bodies, and government as the influencing agents with factor loading ranging from 0.63 to 0.74. The second factor, labelled as family-and-peer advice, included family or friends and colleagues as the influencing agents with factor loading ranging from 0.65 to 0.66. In this study, the internal consistency was satisfactory for the scores in both factors ($\alpha = 0.94$ and 0.89, respectively).

2.2.4. Outcome and covariates

Participants were asked to self-report whether they had received an influenza vaccination in the influenza seasons in 2016/17 (i.e., November 2016 to February 2017) and 2015/16 (i.e.,

September 2015 to February 2016). Vaccination status in 2016/17 was the outcome, whereas the vaccination status in 2015/16 was a covariate. Their self-reported age, sex, level of education received in nursing (1 = degree holder and 0 = non-degree holder), work settings (1 = public and 0 = private), years in nursing practice (1 = 5 years or less, 2 = 6–10 years, 3 = 11–15 years, 4 = 16–20 years, 5 = 21 years or more), frequency of direct contact with patients (1 = almost all of the time, 0 = less than all of the time), and availability of free influenza vaccination were also included as covariates in the analyses. The hospitals, clinics, or other services provided by the Department of Health of the government of the Hong Kong Special Administrative Region, or the Hospital Authority, a statutory body responsible for the management of all public hospitals were classified as public services. All other hospitals, clinics or services were classified as private. Covariates were selected with reference to previous studies on seasonal influenza vaccination among nurses (Kan et al., 2018; Zhang et al., 2011).

2.3. Analysis

2.3.1. Sample representativeness

To examine the potential bias on the elimination of incomplete cases, the sample characteristics were compared between those with complete and incomplete responses. In addition, we conducted a chi-square test to examine the association between vaccination (season 2016/17) and the means to know the survey (i.e., via AHKNS versus personal referrals). To further determine the sample representativeness, the characteristics of the current sample were compared with those reported in two large-scale Manpower Surveys, one for registered nurses in 2016 with a response rate of 39.4% (Department of Health, 2016) and one for enrolled nurses in 2015 with a response rate of 33.1% (Department of Health, 2015), conducted by the government of the Hong Kong Special Administrative Region. Some nurses enrolled in 2015 might become registered nurses in 2016 and could have participated in both surveys. Although the cases might not be completely independent, the combined data should serve as a reasonable proxy of the population for comparison given the large sample sizes and reasonable response rates.

2.3.2. Test of the mediation model

The mediating effects were tested using structural equation modeling (SEM) in 2 steps using M*plus* Version 8 (Muthén and Muthén, 1998–2017). First, a confirmatory factor analysis (CFA) was conducted to identify any misspecification of the measurement model. In the CFA, 6 latent factors (i.e., collectivism, power distance, self-and-clan protection, community protection, authority advice, and family-and-peer advice) were each identified by 3 indicators. When the number of items for a factor exceeded 3, the items were randomly parceled to enhance scale commonality, approximation of distribution of the target construct, modeling efficiency, and estimation stability (Matsunaga, 2008). An acceptable model fit was indicated by a combination of indices, including a non-significant Chi-square value, comparative fit index (CFI) and Tucker-Lewis Index (TLI) greater than 0.95, and root mean square error of approximation (RMSEA) smaller than 0.07 (Hooper et al., 2008). Second, the mediation model was assessed by SEM. Specifically, self-and-clan protection and community protection were regressed on collectivism, whereas authority advice and family-and-peer advice were regressed on power distance. Vaccination in 2016/17, as a binary variable, was regressed on the 6 latent factors. Vaccination and the mediators were all regressed on the covariates (i.e., age, sex, education, work setting, frequency of patient contact, free vaccination availability, and vaccination record the year before). Due to its high dependency with age, $r = .89$, $p < .001$, years in nursing practice was not included. Collectivism, power distance, and age (which was the only continuous covariate) were allowed to be correlated. Also, the residual variances of the mediators were allowed to be correlated. Maximum likelihood estimation was not possible because this model required numerical integration with 6 dimensions, which was computationally intensive and vulnerable to convergence problems. Therefore, the weighted least square mean and variance (WLSMV), which is the default estimator for binary outcomes in M*plus*, was used. Probit regression was used to estimate vaccination status in 2016/17 when using WLSMV estimation. In this case, vaccination could be considered as a latent variable, with a higher score indicating a stronger vaccination propensity (Long and Freese, 2005). The model fit indices of the SEM were examined. The significance of indirect effects was determined by examining the bias-corrected bootstrap confidence intervals using 5000 bootstrap samples.

2.3.3. Subgroup analyses

To examine whether the mediation paths might be influenced by the demographic factors, a set of subgroup analyses was conducted. A total of 8 dichotomous variables including age groups (younger = <40 years of age; older = 40 or older), gender, education, work setting, frequency of patient contact, free vaccination availability, and past vaccination record was used to define the subgroups. A multi-group mediation model was tested for each dichotomous demographic factor using 5000 bootstrap samples. In the model, the factor loadings of the corresponding latent factors were constrained to be the same across the subgroups. For instance, the mediation model was tested in both age groups. Each of the specific indirect effects (e.g., power distance to vaccination via authority advice) and direct effects (e.g., power distance to vaccination) were compared between the two age groups by using the model constraint function in M*plus*.

3. Results

3.1. Descriptive statistics

The survey platform recorded 1855 attempts to respond to the survey. For the current study, 113 students and 102 respondents who had retired or quit the nursing profession were excluded, resulting in 1640 cases. Among those, 1386 nurses who provided complete responses on the vaccination record and the psychosocial factors were included in the analyses. The study size of 1386 was able to detect a margin of error of 2.6% given a confidence interval of 95%. The mean age of the sample was 37.82 ($SD = 10.36$). The majority of respondents were women (89%). Nursing degree holders represented 42% of the sample. Most of them worked in the public sector (61%) and reported that they had direct contacts with patients almost all of the time (61%). The median number of years in nursing practice was between 6–10 years and 11–15 years. Free influenza vaccination was available for 89% of the participants. Among the participants, 85% reported that they had received the survey invitation from AHKNS. The vaccination intake rate was not different between nurses invited via AHKNS and those who were not, $\chi^2\ (1) = 0.44$, $p = .51$.

In the analyzed sample, the reported influenza vaccination coverage was 36% and 33% for the seasons from November 2016 to February 2017 and from September 2015 to February 2016, respectively. The vaccination uptake in 2015/16 was significantly associated with vaccination uptake in 2016/17, $r = .66$, $p < .001$. The sample characteristics, frequencies of vaccination by the dichotomous demographic factors and crude odds ratios predicting vaccination in 2016/17 by each studied construct are presented in Table 1. The bivariate correlations among the studied variables are shown in Table S1 in the supplementary data.

Table 1
Sample Characteristics, Frequencies of Vaccination in 2016/17 by Levels of Binary Variables, and Crude Odds Ratios Predicting Vaccination in 2016/17 (N = 1386).

		Vaccination status in 2016/17			
	Overall	Yes	No	OR	(95% CI)
Binary predictors	*n* (%)[a]	*n* (%)[b]	*n* (%)[b]		
Women					
Yes	1240 (89.5)	433 (34.9)	807 (65.1)	0.75	(0.53, 1.06)
No	146 (10.5)	61 (41.8)	85 (58.2)		
Degree holder					
Yes	578 (41.7)	197 (34.1)	381 (65.9)	0.89	(0.71, 1.11)
No	808 (58.3)	297 (36.8)	511 (63.2)		
Public work setting					
Yes	840 (60.6)	329 (39.2)	511 (60.8)	**1.49**	**(1.18, 1.87)**
No	546 (39.4)	165 (30.2)	381 (69.8)		
Frequent contact					
Yes	849 (61.3)	295 (34.8)	554 (65.3)	0.90	(0.72, 1.13)
No	537 (38.7)	199 (37.1)	338 (62.9)		
Free vaccination					
Yes	1230 (88.7)	476 (38.7)	754 (61.3)	**4.84**	**(2.92, 8.01)**
No	156 (11.3)	18 (11.5)	138 (88.5)		
Vaccination (2015/16)					
Yes	457 (33.0)	370 (81.0)	87 (19.0)	**27.61**	**(20.44, 37.29)**
No	929 (67.0)	124 (13.4)	805 (86.7)		
Continuous predictors	*Mean* (*SD*)				
Age	37.82 (10.36)	–	–	**1.02**	**(1.01, 1.03)**
Collectivism	3.00 (0.61)	–	–	**1.52**	**(1.26, 1.84)**
Power distance	2.17 (0.58)	–	–	1.20	(0.99, 1.45)
Self and clan protection	3.26 (1.18)	–	–	**2.06**	**(1.84, 2.30)**
Community protection	3.10 (1.14)	–	–	**1.73**	**(1.55, 1.92)**
Authority advice	2.95 (0.89)	–	–	**4.77**	**(3.94, 5.77)**
Family-and-peer advice	3.06 (0.85)	–	–	**4.61**	**(3.79, 5.61)**

Note: Significant odds ratio (95% confidence interval) are presented in bold face.
[a] The percentages were computed by the levels of the binary predictors.
[b] The percentages were computed by the vaccination status in 2016/17 (i.e., yes or no) within each level of the binary predictor.

3.2. Sample representativeness

Compared with those who were excluded, the nurses included in the analyses were older (by 6.49 years), less likely to be degree holders (by 13.3%), more likely to work in public settings (by 27.3%), more likely to have frequent contact with patients (by 24.0%), and more likely to have freely available vaccination (by 14.9%). Sex composition and past vaccination status were not different between those included and those excluded. Compared with the nurses in the two Manpower Surveys, the nurses included in the current analyses were more likely to be younger (by 3.74 years) and female (by 2.1%), less likely to be degree holders (by 11.0%) and working in public services (by 7.1%). The results of these comparisons are presented in Table S2 in the supplementary data.

3.3. Test of the mediation model

The results of the CFA indicated that the goodness of fit of the measurement model was satisfactory: χ^2 (75) = 242.14, $p < .001$, CFI = .99, TLI = .98, RMSEA = .04 (90% CI = .04, .05). The standardized factor loadings in the CFA ranged from .55 to .96 and were all significant. The goodness of fit of the mediation model tested using SEM, however, was unsatisfactory, χ^2 (169) = 1155.34, $p < .001$, CFI = .85, TLI = .79, RMSEA = .07 (90% CI = .06, .07). The mediation model was re-specified based on modification indices. Only structural paths were considered because the results of the CFA did not indicate any misspecification in the measurement model. Four structural paths which were theoretically plausible (see discussion) were added in the revised mediation model. Specifically, power distance was also regressed on self-and-clan protection and community protection, whereas collectivism was also regressed on authority advice and family-and-peer advice. The model fit indices suggested the revised mediation model was marginally satisfactory: χ^2 (165) = 652.00, $p < .001$, CFI = .93, TLI = .89, RMSEA = .05 (90% CI = .04, .05). The results of the revised mediation model are shown in Table S3.

3.4. Subgroup analyses

The results of the subgroup analyses showed that none of the indirect effects was different between the subgroups defined by the dichotomous covariates except past vaccination status. The goodness of fit of the multi-group mediation analysis by past vaccination status was satisfactory: χ^2 (318) = 582.96, $p < .001$, CFI = .95, TLI = .93, RMSEA = .04 (90% CI = .03, .04). The results showed that 3 indirect effects and both direct effects were different between those vaccinated and non-vaccinated in the past. Specifically the positive effect of collectivism on vaccination via self-and-clan protection was significant in nurses vaccinated in the past, β = .05 (.02, .10), but not in those who were non-vaccinated, β = −.01 (−.07, .03), whereas the negative effect of collectivism on vaccination via community protection was significant in nurses vaccinated in the past, β = −.05 (−.10, −.02), but not in those non-vaccinated, β = .05 (−.04, .17). For power distance, its positive effect on vaccination via authority advice was significant in nurses vaccinated in the past, β = .10 (.02, .22), but not in those non-vaccinated, β = −.02 (−.11, .01). Regarding the direct effects, the negative effect of collectivism was significant in nurses who were not vaccinated in the past, β = −.27 (−.42, −.12), but not in those who were vaccinated, β = .00 (−.11, .12), whereas the positive effect of power distance on vaccination was significant in nurses who were not vaccinated in the past, β = .23 (.07, .40), compared with those who were vaccinated, β = −.10 (−.23, .03). The standardized coefficients of the multi-group mediation model are shown in Fig. 2. The direct, specific indirect, total indirect, and total effects of collectivism and power distance by past vaccination status are presented also in Table 2.

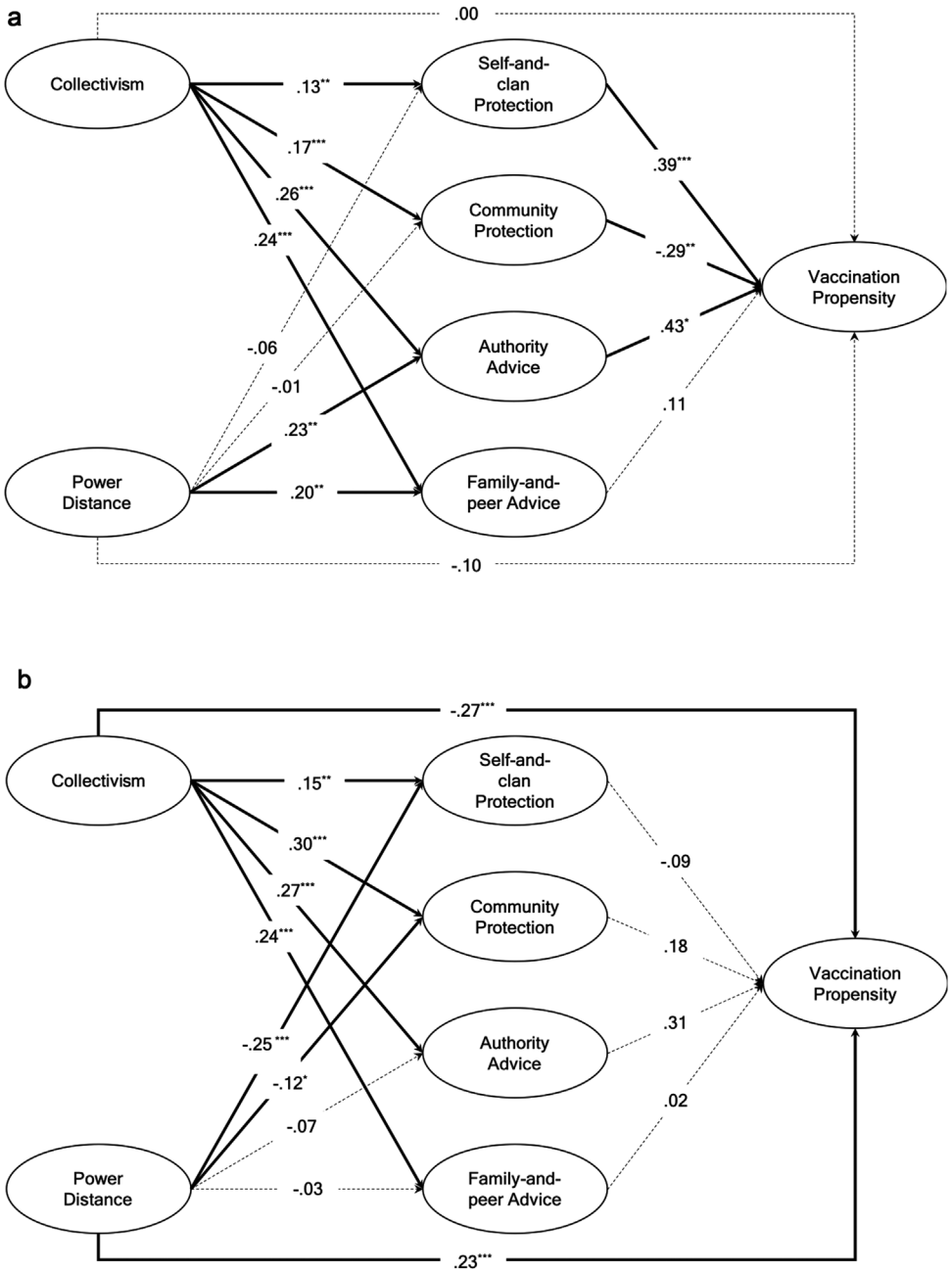

Fig. 2. The Multigroup Mediation Model (a) Adoption Model, for nurses not vaccinated in 2015/16 ($n = 929$). (b) Maintenance Model, for nurses vaccinated in 2015/16 ($n = 457$).
Note: Paths with significant coefficients are presented using solid lines.

4. Discussion

This study examined whether the effects of collectivism and power distance on vaccination were mediated by social benefits (self-and-clan protection and community protection) and social influence (acceptance of authority advice and family-and-peer advice), respectively, among nurses in Hong Kong using a cross-sectional survey. The population of registered or enrolled nurses in Hong Kong in 2017 was 54,231 (The Nursing Council of Hong Kong, 2018). This study was able to obtain 1386 valid surveys for the analyses.

In this study, influenza vaccination uptake rates were 33% and 36% in 2015/16 season and 2016/17 season, respectively. The uptake rates were comparable to those of 2013/14 and 2014/15 seasons (32% and 28% respectively) of the same population (Chan et al., 2015). The mean scores of collectivism and power distance were at the midpoint (3.00 on a scale of 1–5) and below the midpoint (2.17 of a scale of 1–5) of the scales, respectively, indicating that nurses in Hong Kong overall had a balanced level of collectivism and individualism and tended to question authority and attempt to redistribute power. The two sources of protection motivation were highly correlated, so as the acceptance of two sources of advice. As these related factors have resulted from factor analyses and were able to yield meaningful results in the subsequent models (see discussion below), they could be considered as related but different constructs.

Table 2
Indirect Effects for the Overall Mediation Model and for the Subgroup Analysis by Past Vaccination Status.

	Overall model	Nurses non-vaccinated in 2015/16	Nurses vaccinated in 2015/16
Collectivism			
Direct effect: → vaccination (a1)	−.06 (−.12, .01)	.00 (−.11, .12)[a]	**−.27 (−.42, −.12)**
Indirect effect:			
→ self-and-clan protection → vaccination (b1)	**.02 (.01, .05)**	**.05 (.02, .10)**[a]	−.01 (-.07, .03)
→ community protection → vaccination (c1)	−.02 (−.05, .00)	**−.05 (−.10, −.02)**[a]	.05 (−.04, .17)
→ authority advice → vaccination (d1)	**.07 (.02, .14)**	**.11 (.02, .24)**	**.09 (.00, .25)**
→ family-and-peer advice → vaccination (e1)	.02 (−.04, .07)	.03 (−.06, .13)	.01 (−.10, .09)
Total indirect effect: (b1 + c1 + d1 + e1)	**.09 (.06, .12)**	**.14 (.09, .20)**	**.13 (.05, .22)**
Total effect: (a1 + b1 + c1 + d1 + e1)	.04 (−.02, .10)	**.14 (.03, .25)**[a]	**−.14 (−.27, −.01)**
Power distance			
Direct effect: → vaccination (a2)	**.02 (−.05, .09)**	−.10 (−.23, .03)[a]	**.23 (.07, .40)**
Indirect effect:			
→ self-and-clan protection → vaccination (b2)	**−.02 (-.05, -.01)**	−.02 (−.07, .01)	.02 (−.05, .12)
→ community protection → vaccination (c2)	.01 (−.00, .02)	.00 (−.02, .04)	−.02 (−.09, .01)
→ authority advice → vaccination (d2)	**.03 (.01, .08)**	**.10 (.02, .22)**[a]	−.02 (−.11, .01)
→ family-and-peer advice → vaccination (e2)	.01 (−.02, .04)	.02 (−.05, .11)	−.00 (−.04, .02)
Total indirect effect: (b2 + c2 + d2 + e2)	.03 (−.01, .06)	**.10 (.04, .17)**[a]	−.02 (−.10, .05)
Total effect: (a2 + b2 + c2 + d2 + e2)	.05 (−.02, .12)	.01 (−.12, .12)[a]	**.21 (.06, .36)**

Note: $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$. In the parentheses in the last column are the 95% bias-corrected bootstrap confidence intervals. Significant effects based on the 95% bias-corrected bootstrap confidence intervals were presented in bold face.

[a] Denotes significant differences in the effects between nurses vaccinated and non-vaccinated in 2015/16.

4.1. Self-and-clan protection as social benefits

The results of the factor analysis revealed that the benefits of vaccination on the self, and family and friends could be combined as a factor. The combined construct of self-and-clan protection was weakly associated with collectivism. In collectivistic cultures, the self is an integral part of the in-group, whereas, in individualistic cultures, the self is independent from the in-group (Triandis, 2001). Family and friends are usually the main definition of in-group in collectivistic cultures (Triandis et al., 1988). Although self-interest, which may reflect individualism, is included in the construct of self-and-clan protection, we considered this construct more closely manifesting social motives toward the in-group in the current population, as supported by the correlation between collectivism and self-and-clan protection. In contrast, the work-place and the country could be considered as out-groups.

4.2. Justifications for model re-specification

Based on the modification indices in SEM, we revised the mediation model such that social benefits and social influence mediated both the effects of collectivism and power distance on vaccination. With regards to the association between collectivism and social influence, the result of a meta-analysis has shown that people in collectivist countries showed higher levels of conformity than those in individualistic countries (Bond and Smith, 1996). It is theoretically plausible that nurses with higher levels of collectivism may be more influenced by advice from people at different levels of the power hierarchy. For the association between power distance and social benefits/motivation, in a series of studies, Winterich and Zhang (2014) showed that consumers with higher levels of power distance felt less responsible to help other and hence had less charitable behaviors. Similarly, nurses with higher levels of power distance may be less motivated to vaccinate by the protection toward others.

The results of the mediation model were invariant between the subgroups defined by most of the demographic characteristics except past vaccination status. We referred the models as the *adoption model* for nursed non-vaccinated in the past and the *maintenance model* for nursed vaccinated in the past. Rothman (2000) suggested that the decision criteria for initiating a health behavior can be different from maintaining that behavior. For instance, access to physical activity equipment was predictive for physical activity adoption, whereas perceived satisfaction and self-efficacy were predictive of physical activity maintenance in a home-based physical activity intervention (Williams et al., 2008). The findings of this study were very unique because behavioral maintenance is usually irrelevant to vaccination. Influenza vaccination is an exception as it can be taken every season. As the results of the mediation model in the overall sample were conditional on past vaccination status, only the results of the multigroup mediation model were interpreted in the following discussion.

4.3. Mechanisms of cultural values

4.3.1. Adoption model

Collectivism influenced vaccination through 3 indirect paths in the adoption model. The indirect effects of collectivism on vaccination via self-and-clan protection and authority advice were positive, whereas the indirect effect via community protection was negative. Although the indirect effects of collectivism on vaccination were mixed, the total indirect effect and the total effect of collectivism were significant and positive.

First, the mediating role of self-and-clan protection might be consistent with the in-group favoritism among collectivists (Chen et al., 2002; Gomez et al., 2000). Collectivists are more capable of differentiating between in-group and out-group, whereas individualists are more able to differentiate between the self and others (Iyengar et al., 1999). At the society level, Hong Kong remains in a collectivistic culture (Hofstede, 2003), despite being colonized by Britain for more than 150 years. Second, our findings, surprisingly, showed that community protection was negatively associated with vaccination, suggesting that social motivation is not an effective means for promotion. Free riding may occur in vaccination decisions when the actions benefit the wider community (i.e., enjoying the benefits by the vaccination of others), and emphasizing social benefits may reduce free riding only when the cost of vaccination was low (Betsch et al., 2013). Unfortunately, vaccination may be considered as costly among the nurses in Hong Kong given a vaccination coverage of only around 30%. Third, the indirect effect of collectivism on vaccination via authority advice was significant and positive, which was consistent with the evidence suggesting collectivists may be more likely to conform than individualists (Bond and Smith, 1996) as mentioned above.

Consistent with our predictions, the positive indirect effect of power distance on vaccination adoption via authority advice was significant and led to a significant total indirect effect. The findings supported the notion that individuals who tend to accept the power hierarchy are more likely to be affected by advice at higher levels (Asgari et al., 2008). As authority advice symbolizes a high position in the power hierarchy, its mediating role was well expected. However, the mediating role of family-and-peer advice was not supported. It was not surprising considering that high-credibility sources have been found to be more persuasive than low-credibility sources (Pornpitakpan, 2004).

4.3.2. Maintenance model

The pattern of results in the maintenance model was quite different from that of the adoption model. Three indirect effects including collectivism to vaccination via self-and-clan protection, collectivism to vaccination via community protection, and power distance to vaccination via authority advice in the maintenance model were significantly weaker compared to those in the adoption model. On the other hand, the direct effects of collectivism and power distance were stronger in the maintenance model compared with those in the adoption model.

The adoption and maintenance of influenza vaccination, like other health behaviors (Rothman, 2000), may be guided by different mechanisms. The findings suggest that, once adopted, the social factors, particularly social benefits, are not as important in maintaining the behavior. Collectivists have been shown to be less confident about their decisions compared to individualists (Mann et al., 1998). Therefore, nurses with higher levels of collectivism may be more likely to regret their previous vaccination decisions compared with those with lower levels of collectivism. As discussed above, individuals with high levels of power distance may feel less responsible for their decisions (Winterich and Zhang, 2014). If vaccination is adopted to conform to the higher power, it is less likely for individuals to change the behaviors for personal reasons. Considering the uniqueness of vaccination maintenance, future studies may apply the theories and concepts accounting for maintenance of other health behaviors to examine influenza vaccination maintenance. For instance, recovery self-efficacy and satisfaction with health outcomes have been found to predict the maintenance of a walking group program (Kassavou et al., 2014).

4.4. Limitations

There were several limitations to this study. The cross-sectional survey design was used in this study. Hence, no causal relationships could be established. Reverse causality might also explain the behaviors. That is, nurses who received an influenza vaccination might justify their behaviors by enhancing their prosocial motivation and the level of advice acceptance. Longitudinal studies and experimental studies can be used in the future to enhance confidence in the direction of causality. Self-report data were also subject to the influence of social desirability and recall bias. Objective vaccination records are more preferable. The generalizability of this study should be interpreted with caution. A number of differences in the sample characteristics were identified between the current sample and those of Manpower Surveys. However, the potential bias due to non-response could not be adequately assessed because the response rates of the Manpower Surveys were less than satisfactory (less than 40%). A direct comparison with the characteristics of the target population, if available, can more fully reflect the impact on external validity. The results of the subgroup analyses, however, showed that the indirect effects tested in this study were not affected by demographic and background factors, except for past vaccination status. Although the current sample might be more representative for nurses with certain characteristics, there was no evidence to suggest that the structural relationships tested in the models were biased. Nurses in Hong Kong formed the study population. The extent to which the findings can be generalized to other cities or countries requires further investigation.

4.5. Conclusion

This study was the first to examine the effects of individual-level cultural value orientations on seasonal influenza vaccination among nurses. In addition, the social aspects of the mechanisms of these cultural values were examined. Collectivism and power distance influence both vaccination adoption and maintenance, but the underlying mechanisms are different. Overall, the results suggest that collectivism and power distance are highly relevant to the social motivations for vaccination adoption. Regarding vaccination maintenance, further investigation into the mechanisms is needed.

As countries were different in the cultural dimensions (Hofstede, 2003), some variations can be expected when testing these relationships in other countries. In particular, the construct of self-and-clan protection, and its relevant relationships, may be unique to collective cultures. Self and close ties may be manifested as separate constructs in individualistic cultures. Empirical evidence is needed to ascertain the extent to which the findings can be generalized to other populations, especially for those in individualistic cultures.

From a practical perspective, modifying cultural values may not be an appropriate intervention strategy, because changes in the cultural values may lead to changes in other social behaviors (for a review, see Kirkman et al., 2006), which may not be desirable. However, a better understanding of the cultural influences may provide an important insight to change. Future studies may contextualize these cultural values in professional work settings. Instead of cultural value orientations, the impact of organizational culture on vaccination can be examined. For instance, workplace collectivism, social responsibility, professional obligation, and power distance in the workplace may be some relevant concepts that can be properly intervened at the personal and/or organizational levels. Nevertheless, the mediators identified in this study can inform the development of vaccination adoption strategies. Specifically, nurses in collectivistic cultures may benefit from a vaccination promotion strategy that focuses on the protection toward the in-group members, which are often their family members and friends and the use of authority figures when giving vaccination advice.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.ijnurstu.2019.05.007.

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