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VALIDITY AND RELIABILITY OF HEALTH BELIEF MODEL APPLIED TO INFLUENZA

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ABSTRACT

Influenza causes morbidity, mortality and great economic losses on epidemic and pandemic levels. Immunization against the disease has shown to be effective in prevention. Study aimed to measure the validity and reliability of health belief model as applied to influenza in Turkey. The data were collected with a ''sociodemographic data'' form and ''health belief model applied to influenza" form. A methodological research (n: 440) conducted with health care workers. Validity studies included the following parameters: language validity, content validity, and construct validity. Reliability studies included the following variables: the tool's internal consistency reliability, Cronbach's alpha reliability coefficient, and test–retest reliability. The content validity index was found to be 0.92. The tool's internal consistency reliability for the subscales ranged from 0.97 to 0.99 Cronbach's alpha value of the whole scale was found 0.91. The tool's test–retest reliability was 0.94. Final scale included 29-item and five subscales. It was a valid and reliable tool for measuring beliefs toward influenza among health care workers.

Keywords: Health beliefs, influenza, reliability, validity

INTRODUCTION

Influenza, more commonly referred to as "the flu," is a contagious viral infection of the nose, throat and lungs (National Foundation for Infectious Disease, 2004). In Turkey and in other countries, influenza is a commonly occurring virus with high morbidity and unacceptable mortality rates from its squeal(Hacımustafaoglu, 2005). Influenza causes morbidity, mortality and great economic losses on epidemic and pandemic levels (Williams, Chen, Cho, & Chin, 2002). The most effective strategy for preventing influenza is annual vaccination. Strategies that focus on providing routine vaccination (CDC, 2010).

Health Care Workers (HCWs) are at a greater risk of contracting influenza due to their close contact with patients. Vaccination against influenza is estimated to provide greater than 60% protection against infections, so it important to pragmatically immunize both patients and HCWs (Bridges, Kuehnert, & Hall, 2003). Because potentially contagious HCWs may infect the patients they serve, it is important for infected HCWs (and those suspected of infection) to avoid contact with patients (CDC, 2010).

Centers for Disease Control and Prevention (CDC) suggest that HCWs' vaccination rates be used as a measure of patient safety (CDC, 2010; National Health Interview Survey, 2009). Despite the recommendations of the CDC and the availability of an effective vaccine, most HCWs do not receive an annual influenza vaccination. The National Health Interview Survey (2009) reported HCW vaccination rates for influenza to be 53%. A nationwide survey in Greece reported the overall vaccination rate among HCWs to be 65.36% (Maltezou et al., 2008). Gilca et al. (2009) reported that 44% of nurses strongly agreed with the usefulness of the influenza vaccine (Gilca, Boulianne, Dubé, Sauvageau, & Ouakki, 2009). Despite the annual vaccination recommended by The Ministry of Health of Turkey, only 35% of HCWs received influenza vaccination for the 2009-2010 influenza seasons (Republic of Turkey Ministry of Health Directorate General of Primary Health Care, 2010; Torunoglu, 2009). Influenza vaccine acceptance has been found to be associated with perceived seriousness of the influenza infection, effectiveness in avoiding illness, protecting others, convenience, vaccine cost, and

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misconceptions about influenza and the vaccine (Blue & Valley, 2002; CDC, 2010; Shahrabani, Benzion, & Yom Din, 2009).

The health belief model (HBM) is a psychological model that attempts to explain and predict health behaviors by focusing on the attitudes and beliefs of individuals. A group of psychologists (Hochbaum, Kegeles, Leventhal and Rosenstock) who were working for the United States Public Health Services developed the HBM in the 1950s. The model has evolved and has been refined throughout the 1960s to account for ongoing research related to the role that knowledge and perceptions play in personal responsibility for health behaviors. (Rosenstock, 1966).Four perceptions serve as the main constructs of the model: 1) susceptibility (a perceived personal vulnerability to a health condition); 2) seriousness (an individual's belief about the severity of a disease); 3) benefits (perceived positive attributes of an action); and 4) barriers (perceived negative aspects related to an action). For a new behavior to be adopted, a person needs to believe that the benefits of the behavior outweigh the consequences of continuing the old behavior. More recently, other constructs have been added to the HBM, such as cues to actions. Examples include illness of a family member, media reports, or advice from a health care provider. Health motivation refers to a generalized state of intent that results in behaviors to maintain or improve health. Knowledge about a particular illness threat can also influence health behavior indirectly through affecting an individual's perceptions (Blue & Valley, 2002; Shahrabani, Benzion, & Yom Din, 2009). The health belief model has generated prolific research on behaviors for maintenance of health or prevention of disease in asymptomatic subjects. The investigation of attitudinal components in health-related behaviors is important. If attitudes related to health behavior can be identified, health protection interventions for attitude change can be developed, and an increase in the desirable health behavior would result. The model was revised and validated by Victoria Champion to examine HBM constructs related to breast cancer and screening (Champion, 1984). Blue and Valley (2002) adapted Champion's HBM (with Champion's permission) to influenza (Blue & Valley, 2002)). The Health Belief Model Applied to Influenza (HBMAI) has been translated and tested in other cultures such as China, Israel, and the Netherlands(Champion, 1984; Shahrabani, et al., 2009;Mok, Yeung, & Chan, 2006). Significant increases in influenza vaccination rates have been seen with intervention studies based on the HBM applied to influenza. In addition, other studies have found positive correlations between participation in influenza vaccination and the HBM constructs (Blue& Valley, 2002; Looijmans-van den Akker et al., 2009; Mok, et al., 2006; Shahrabani, Benzion, & Yom Din, 2009).

Despite the low influenza vaccination rates (35%) for HCWs in Turkey, a valid and reliable instrument for determining the beliefs of Turkish HCWs has not been reported.(Torunoglu, 2009) The aim of this study was to assess the validity and reliability of the Turkish language version of the HBMAI to measure Turkish HCWs' beliefs about influenza vaccination.

METHOD

Sample

A methodological study was conducted at the Family Health Centers, Community Health Centers and Mother and Child Care and Family Planning Centers located in center of Izmir. Potential HCWs were informed verbally about the aim of the study, and then asked if they agreed to give their e-mail addresses to join the internet-based questionnaire. The survey was administered via a secure, internal website. Both the "sociodemographic form" and "Health Belief Model Applied to Influenza" were part of the online survey. Researchers sent an invitation by e-mail to participate on March 16, 2010 with a link to the online survey. Of the 1895 e-mail invitations sent to eligible HCWs, 915 were undeliverable. The authors were looking for n=440 to power the survey; thus, the sample population met the criteria for an acceptable sample, which was at least 10 times the total number of items on the tool (Burns & Grove 2001). Responses were automatically entered into a database (Survey Tracker e-mail/Web Survey Software for Web Surveys 4.5) as respondents completed the survey. No respondents received a reminder with another link to the survey. When the system reached n=440 replied, the link was closed automatically, and enrollment stopped (on April 28, 2010). The questionnaire took approximately 5-10 minutes to complete. No incentives were given to participants

in return for completing the survey. The survey was completed by 440 HCWs (100%). There were no missing data for the survey.

Procedure

Permission to use the HBMAI was received from one of the tool's authors (Carolyn Blue) in 2008. The study was approved by the Ethics Committee of Ege University Faculty of Nursing. Permission was also received from the İzmir Provincial Directorate of Health. Health care workers provided informed consents by completing and submitting the survey. All the HCWs who participated in the research were informed about the research and its purpose and were informed that withdrawal from the study was optional at any time.

Research Instrument

The modified HBMAI instrument included 44 items on seven constructs: perceived susceptibility – "SUS" (7 items), perceived seriousness-"SER" (6 items), perceived benefits – "BEN" (6 items), perceived barriers – "BAR" (8 items), knowledge – "KN" (6 items), health motivation – "HM" (6 items) and cues to action-"CA" (5 items). Each scale has 5 response choices ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Negative items (2, 32, 33. item) were reverse scored, and higher scores showed stronger feelings related to that construct. The Cronbach's alpha coefficient varied between 0.65 and 0.97 for the tool's subscales and was 0.70 for the tool as a whole (Blue & Valley, 2002).

Translation and back translation

The tool was translated from English to Turkish by three nursing instructors and two English specialists. The five translated versions were compared by the authors, and the researchers developed a common Turkish text from these five Turkish translations. Then, the initial translation into Turkish was translated back into English by both English language specialists who had not seen the original English text and by a linguist. The tool's English statements that had been translated from Turkish into English were compared with the original statements, and any necessary revisions were made.

Content validity

The panel of professionals consisted of three public health instructors, two public health physicians, two microbiologists, one philosophy instructor and two psychiatrists. The content validity index (CVI) was used. The CVI was calculated using a 4-point ordinal rating scale ranging from ''1'' (not relevant) to ''4'' (very relevant). The content validity index for an item is the proportion of experts who rate an item as a 3 or 4 (Grant & Davis, 1997).

Pilot study

The preliminary Turkish version of the scale was conducted with 20 participants. The results from the pilot study showed that the questions were still understandable, and no changes in wording were needed. These participants were not included in the larger study.

Data Analysis

The statistical program SPSS 16.0 was used to analyze the data. Descriptive statistics were calculated for the sociodemographic characteristics.

Construct validity was analyzed by means of factor analysis with varimax rotation. To attain the best fitting structure and the correct number of factors, the following criteria were used: eigenvalues higher than 1.0 and factor loadings higher than 0.30[19]. Before conducting the factor analysis of the instrument, Kaiser Meyer Olkin (KMO) and Barlett's test was calculated to evaluate whether the sample was large enough to perform satisfactory factor analysis.

Scale was tested using Cronbach's alpha reliability coefficients. Reliability was also assessed by interpreting the item-total subscale correlations. The criteria used to identify non-homogenous items were either an increase of >0.10 in the total scale reliability when the item was deleted or a correlation of <0.25 between the item and the subscale score [19]. For the retest study, 30 voluntary HCWs joined the retest study. The survey was again sent by e-mail two weeks later, and Pearson's correlation was calculated.

FINDINGS

The mean age of the HCWs who participated in the research was 42 years (SD ±5.31). The following are the demographics for HCWs: 65.0% were female, 35.0% were male, 73.4% were married, 54.8% were doctors, 23.9% were nurses, and 21.3% were midwives. The majority of the HCWs (79.8%) worked at the Family Health Center (Table 1).

In the content validity studies, two items with a CVI lower than 0.80 were changed based on specialists' recommendations, and the tool was presented in its final form. The calculated CVI for the total scale was 0.92. In the susceptibility subscale the statement, ''I will get the flu next year" was changed to ''I could get the flu next year,'' In the seriousness subscale, the statement, ''Getting the flu would disrupt my family" was changed to ''Getting the flu would disrupt my family life."

The factor analysis for the subscale related to the HBMAI was conducted using 29 items (Table 2). The Kaiser Meyer Olkin measure was 0.91 (Barlett 30329.7, $p<0.001$). Five significant factors were identified for the HBMAI, two less than the amount originally specified (Table 2). Seven items in the "SUS" subscale and 1 item in the "SER" subscale comprised 30.11% of the variance with Factor 1. Four items in the "SER" subscale comprised 23.47% of the variance with Factor 2. All of the "BEN" subscale items comprised 20.95% of the variance with Factor 3. All of the "BAR" subscale items comprised 13.19% of the variance with Factor 4. Three items in the tool's "CA" subscale comprised 8.78% of the variance with Factor 5. Of the tool's total variance, 95.52% was explained. As a result of the factor analysis, only one item (SER 8) was observed to be in a different subscale (susceptibility) (Table 2).

Cronbach's alpha was examined to evaluate the homogeneity of the items in the tool. A total of fifteen items had correlation coefficients that were <0.25 (Table 3). These fifteen items on the tool were seriousness (SER) item 9; knowledge (KN) items 28, 29, 30, 31, 32, and 33; Health Motivation (HM) items 34, 35, 36, 37, 38, and 39; and Cues to Action (CA) items 40 and 41. These items were all removed from the tool. The remaining items were within acceptable limits and had significant correlation coefficients (0.25–0.60). The Cronbach's alpha coefficient for the total scale also increased from 0.86 to 0.91. The Cronbach's alpha values for all the subscales ranged from 0.97 to 0.99. The tool's internal consistency reliability coefficients (Table 3) and the Cronbach's alpha values (after the fifteen items were removed) are shown in Table 4.

The ICC was determined to evaluate the test-retest reliability between the two measurement sessions: ICC=0.94 ($p<0.001$ and 95% CI: 0.96–1.00) (Table 4).

DISCUSSION

In this study, the investigators translated and tested the HBMAI for measuring HCWs' beliefs about influenza vaccination. The results from this study show that the HBMAI is a reliable and valid tool for measuring HCWs' behaviors toward influenza vaccination. The content validity of the instrument, which was reviewed by an expert panel, appears sufficiently high.

The items of the HBMAI subscales were examined for construct validity. Kaiser Meyer Olkin was found to be high and showed that the sample size was excellent. The final version of the HBMAI included 29 items and 5 factors. As a result of the factor analysis, only one item (SER 8) was observed to be in a different subscale – the susceptibility subscale. Seven items in the SUS scale and one item in the SER scale were clustered together. The item that was clustered with the susceptibility subscale stated, "The thought of getting the flu scares me". This difference might be explained by beliefs that vary from person to person, public to public and culture to culture. In addition, health care workers may be more sensitive to health concerns than others because of the nature of their job.

Cronbach's alpha coefficients for all the items (except for fifteen-SER9, KN28, 29, 30, 31, 32, 33, HM34, 35, 36, 37, 38, 39, CA40, and 41) were found to be acceptable corrected item correlations of >0.25 (range 0.25–0.60) (Buyukozturk, 2002). Cronbach's alpha coefficients for all subscales ranged from 0.97 to 0.99 and showed excellent levels of internal consistency.

The Health Belief Model applied to influenza has been translated and tested in other countries such as America, China, Israel and the Netherlands(Blue & Valley, 2002; Looijmans-van den Akker, et al.,

2009; Mok, et al., 2006; Shahrabani, Benzion, & Yom Din, 2009). In these studies, researchers reported reliability results of some parts of the scale in different cultures. In the study conducted by Mok et al (2006), the Cronbach's alpha coefficient was 0.60 for the "SUS" subscale, 0.62 for the "SER" subscale, 0.77 for the "BEN" subscale and 0.86 for the "BAR" subscale. In the research by Shahrabani et al (2009), the Cronbach's alpha coefficient was 0.73 for the "BEN" subscale and 0.63 for the "CA" subscale. The Cronbach's alpha coefficients of all subscales in our study were higher than previous studies. (Blue& Valley, 2002; Mok, et al., 2006; Shahrabani, Benzion, & Yom Din, 2009).In the current study, only five of the seven subscales were found to be valid and reliable. Consistent with the original study, health motivation and knowledge subscales were removed from the tool (Blue & Valley, 2002). This may be explained by cultural relevance and different sample choices. The current study sample focused on HCWs, but in the original study sample, healthy adults were studied. The findings from this study may underline the importance of HCWs' beliefs on influenza vaccination. It is thought that their beliefs greatly affect their decision to get vaccinated and to offer the vaccine to their patients. This instrument will help us to understand Turkish HCWs' beliefs, such as barriers, benefits and the seriousness of influenza vaccination. After the evaluation with the instrument, intervention programs can be designed to improve influenza vaccination. There are potential limitations to this study. This study sample focused on HCWs, but in the original study sample, healthy adults were studied. Therefore, the results cannot be generalized to the entire population; our results reflect the characteristics of HCWs only. In addition, the results are not generalizable for countries other than Turkey.

CONCLUSION

The final scale with 29 items clustered into five subscales represented evidence to support the content and construct validity and internal consistency. The HBM applied to influenza is a valid and reliable tool for measuring the beliefs among Turkish HCWs toward influenza vaccinations. Recommendations are: a) to use this model to assess Turkish HCWs' beliefs about influenza, it is necessary to identify cues and focus on programs specifically tailored to target HCWs' misconceptions and inaccurate beliefs, and b) it is recommended that investigators continue to refine and test the Turkish version of the HBM. A similar study should be designed to compare HCWs from multiple cities within Turkey to ascertain whether there are regional variations related to compliance with vaccinations and to continue to determine whether there are associations between immunizations.

Authors' Note

Study design: ÖE, SÖ; data collection and the data analysis: ÖE, SÖ, and manuscript preparation: ÖE, SÖ.

Declaration of Conflicting Interests

There is no conflict of interest in this study.

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Vol. 2, No. 3, May 2012

Table 1.Demographic characteristics of the study population

	N	*%*
Age groups		
27-32	24	5.5
33-38	121	27.5
39-44	181	41.1
45 and higher	114	25.9
Gender		
Women	286	65.0
Men	154	35.0
Marital status		
Married	323	73.4
Single	45	10.2
Widowed/divorced	72	16.4
Education		
High school	17	3.9
Associate degree	128	29.1
University	264	60.0
Master	22	5.0
Doctorate	9	2.0
Job		
Doctor	241	54.8
Nurse	105	23.9
Midwife	94	21.4
Workplace		
Family Health Center	351	79.8
Community Health Center	33	7.5
Mother and Child Care and	56	21.7
Total	440	100.0

Table 2.Rotated factor analysis of the health belief model

Factor 1, Susceptibility	*Factor 2, Seriousness*	*Factor 3, Benefits*	*Factor 4, Barriers*	*Factor 5, Cues to Action*
SUS7 0.97	SER12 0.97	BEN14 0.98	BAR24 0.99	CA43 0.96
SUS6 0.97	SER10 0.97	BEN18 0.98	BAR22 0.98	CA42 0.95
SUS2 0.96	SER13 0.97	BEN17 0.98	BAR25 0.98	CA44 0.95
SUS1 0.96	SER11 0.97	BEN16 0.96	BAR21 0.98	
SUS5 0.96		BEN19 0.96	BAR23 0.98	
SUS3 0.96		BEN15 0.96	BAR20 0.98	
SUS4 0.94			BAR26 0.98	
SER8 0.92			BAR27 0.94	
Eigenvalue				
8.37	6.80	6.07	3.82	2.57
Variance explained				
30.11	23.47	20.95	13.19	8.78

SUS: Susceptibility; SER: Seriousness; BEN: Benefits; BAR: Barriers; CA: Cues to Action.
N: 440, Item: 29

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Vol. 2, No. 3, May 2012

Table 3.Item analysis and internal consistency of the health belief model

Items	*Mean*	*SD*	*Item total*	*If item*
Susceptibility				
1. Working with multiple people each day increases my chances of	3.11	1.05	0.46	0.86
2. Only people over 65 years of age get the flu	3.13	1.05	0.48	0.86
3. My chances of getting the flu are good	3.13	1.07	0.47	0.86
4. Healthy people can get the flu	3.18	1.08	0.43	0.86
5. I feel the chances of getting the flu in the future are good	3.13	1.05	0.50	0.86
6. I worry a lot about getting the flu	3.09	1.07	0.47	0.86
7. I could get the flu next year	3.14	1.09	0.48	0.86
Seriousness				
8. The thought of getting the flu scares me	3.05	1.04	0.43	0.86
9. If I get the flu, my job would be in danger	2.75	1.01	-0.45	0.88
10. Getting the flu would disrupt my family life	3.23	1.09	0.33	0.86
11. Having the flu would make daily activities more difficult	3.27	1.08	0.34	0.86
12. If I got the flu, it would be more serious than other diseases	3.22	1.09	0.34	0.86
13. Flu can be a serious disease	3.22	1.09	0.33	0.86
Benefits				
14. Getting a flu shot will prevent me from getting the flu	3.15	1.05	0.45	0.86
15. Getting a flu shot will protect others in my household from getting	3.07	1.05	0.41	0.86
16. Getting a flu shot will prevent my from being absent	3.10	1.05	0.44	0.86
17. I have a lot to gain by getting a flu shot	3.13	1.05	0.44	0.86
18. I would not be afraid of getting the flu if I got a flu shot	3.15	1.03	0.46	0.86
19. Having a chronic illness (such as diabetes, heart disease, or asthma),	3.18	1.03	0.47	0.86
Barriers				
20. Getting a flu shot is not convenient for me	2.28	1.18	0.59	0.85
21. In order to get a flu shot, I would have to give up quite a bit	2.26	1.17	0.60	0.85
22. Getting a flu shot can be painful	2.27	1.17	0.59	0.85
23. Getting a flu shot is time consuming	2.24	1.17	0.59	0.85
24. Getting a flu shot interferes with my daily activities	2.27	1.17	0.60	0.85
25. There are too many risks in getting a flu shot	2.29	1.17	0.57	0.85
26. It costs too much to get a flu shot	2.26	1.16	0.57	0.85
27. I am concerned about having a bad reaction to the flu shot	2.36	1.20	0.54	0.86
Knowledge				
28. People get the flu from eating after other people with the flu	4.56	0.54	-0.01	0.86
29. People get the flu from breathing the air of other people who have the	4.51	0.58	0.07	0.86
30. The flu lasts three to five days	4.51	0.58	0.04	0.86
31. Getting the flu can cause more severe illness such as pneumonia	4.55	0.56	0.01	0.86
32. One can get the flu from the flu vaccine	4.51	0.59	0.09	0.86
33. People often get sick from flu injections	4.50	0.59	0.04	0.86
Health Motivation				
34. I eat a well-balanced diet	4.36	0.62	-0.02	0.86
35. I follow medical orders because I believe they will benefit my state of	4.22	0.77	0.01	0.87
36. I frequently do things on my own to improve my health	4.37	0.62	0.02	0.86
37. I search for new information related to my health	4.28	0.70	-0.02	0.87
38. I have the recommended yearly physical exams in addition to visits	4.34	0.66	0.03	0.86
39. I exercise regularly--at least three times a week	4.26	0.76	-0.01	0.870

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Vol. 2, No. 3, May 2012

Cue to Action				
40. I decided to get a flu vaccine when I read an announcement about the	2.23	1.00	0.19	0.86
41. I got the flu vaccine because a friend or family member told me it	2.01	0.77	0.15	0.86
42. I got the flu vaccine because my doctor or nurse told me it was good	2.00	0.79	0.25	0.86
43. I got the flu vaccine because my supervisor thought it was a good	2.04	0.78	0.25	0.86
44. I got the flu vaccine after hearing an announcement of benefits on the	2.02	0.75	0.25	0.86

N: 440, α=0.86, item: 44

Table 4.Item total subscale correlation and cronbach alpha for subscales (N=440)

Subscale	*Number of items*	*Item-total subscale correlation*	*Internal Consistency (Cronbach α)**	*Test-retest Reliability* (N=30)*
Susceptibility	8	0.47-0.55	0.98	0.99
Seriousness	4	0.36-0.37	0.99	1.00
Benefits	6	0.40-0.47	0.99	1.00
Barriers	8	0.57-0.63	0.99	0.99
Cue to Action	3	0.26-0.29	0.97	0.96
Total	29		0.91	0.94

*All correlations are statistically significant at p< .001.

Health Belief Model applied to Influenza (Turkish version translated)

1 = Strongly disagree

2 = Disagree

3 = Neither agree or disagree

4 = Agree

5 = Strongly agree

Susceptibility **SD D N A SA**

1. Working with multiple people each day increases my chances of getting the flu
2. Only people over 65 years of age get the flu
3. My chances of getting the flu are good
4. Healthy people can get the flu
5. I feel the chances of getting the flu in the future are good
6. I worry a lot about getting the flu
7. I could get the flu next year
8. The thought of getting the flu scares me

Seriousness

9. Getting the flu would disrupt my family life
10. Having the flu would make daily activities more difficult
11. If I got the flu, it would be more serious than other diseases
12. Flu can be a serious disease

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Benefits

13. Getting a flu shot will prevent me from getting the flu
14. Getting a flu shot will protect others in my household from getting The flu
15. Getting a flu shot will prevent my from being absent from work
16. I have a lot to gain by getting a flu shot
17. I would not be afraid of getting the flu if I got a flu shot
18. Having a chronic illness (such as diabetes, heart disease, or asthma), Is a reason for getting the flu vaccine?

Barriers

19. Getting a flu shot is not convenient for me .
20. In order to get a flu shot, I would have to give up quite a bit
21. Getting a flu shot can be painful
22. Getting a flu shot is time consuming
23. Getting a flu shot interferes with my daily activities
24. There are too many risks in getting a flu shot
25. It costs too much to get a flu shot
26. I am concerned about having a bad reaction to the flu shot

Cue to Action

27. I got the flu vaccine because my doctor or nurse told me it was good
28. I got the flu vaccine because my supervisor thought it was a good idea
29. I got the flu vaccine after hearing an announcement of benefits on the radio or television