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Intentions to Seek Information About the Influenza Vaccine: The Role of Informational Subjective Norms, Anticipated and Experienced Affect, and Information Insufficiency Among Vaccinated and Unvaccinated People

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When deciding whether to vaccinate, people often seek information through consequential processes that are not currently well understood. A survey of a nationally representative sample of U.S. adults ($N = 2{,}091$) explored the factors associated with intentions to seek influenza vaccine information in the 2018–2019 influenza season. This survey shed light on what motivates intentions to seek information about the influenza vaccine through the lens of the risk information seeking and processing (RISP) model. The model explained information-seeking intentions well among both unvaccinated and vaccinated respondents. Key findings show that informational subjective norms, information insufficiency, and different types of affect are strong predictors of information-seeking intentions. Theoretical insights on extending the RISP model and practical guidance on designing interventions are provided.

KEY WORDS: Affect; information seeking; norm; risk communication; vaccine

1. INTRODUCTION

Although, as the Centers for Disease Control and Prevention (CDC) states, getting an annual influenza vaccine is the best way to prevent the sickness and death caused by influenza, influenza vaccination rates among U.S. adults remained below 48% from 2010 to 2019, in contrast to the goal of 70% set by Healthy People 2020 (U.S. Department of Health and Human Services, 2019). CDC recently estimated that an additional number of 4,000–11,000 hospitalizations, depending on the severity of the influenza season, could have been prevented with a mere 5% increase in influenza vaccination coverage (Hughes et al., 2019).

Plentiful research has identified the psychological, physical, contextual, and sociodemographic barriers of influenza vaccination intentions and behaviors (Schmid, Rauber, Betsch, Lidolt, & Denker, 2017). Most relevant to our study are the psychological barriers, such as cognitive and affective risk perceptions regarding influenza and the influenza vaccine, subjective norms and perceived behavioral control regarding getting influenza vaccine, and knowledge about influenza and the influenza vaccine (Nowak, Sheedy, Bursey, Smith, & Basket, 2015; Schmid et al., 2017). For example, influenza vaccination resistance may be fueled by misconceptions about the influenza vaccine, including the belief that the flu shot can infect vaccine recipients with

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influenza (Centers for Disease Control and Prevention [CDC], 2019). Moreover, the effectiveness of the influenza vaccine, which must be given annually, varies from season to season, making perceptions of efficacy vary as well (Fiore et al., 2009). These unique features of the influenza vaccine provide opportunities to explore psychological perceptions of risk and its implications for information seeking about the influenza vaccine.

Despite much effort to study facilitators and barriers of influenza vaccine uptake, much less research has addressed seeking influenza vaccine information in the general U.S. adult population (Kindratt et al., 2019). However, the existing research has led to important conclusions. First, Americans actively search for information about the influenza vaccine (Huston, Mekaru, Kluberg, & Brownstein, 2015). Second, unvaccinated (vs. vaccinated) people are less likely to seek information about both health in general and the influenza vaccine specifically (Kindratt et al., 2019; Xie, Grady, Cacciatore, & Nowak, 2019). The finding that vaccinated people are more likely to seek relevant information might be because the way in which information is sought can influence the cognitive structure of a behavioral decision, in this case, whether to receive the influenza vaccine (Griffin, Dunwoody, & Neuwirth, 1999; Hart et al., 2009). Third, information-seeking intentions influence vaccination intentions even after controlling for attitudes, norms, and perceived efficacy regarding vaccination (Yang, 2012). In addition, even if information seeking does not always directly lead to behavioral change (Noguchi, Albarracín, Durantini, & Glasman, 2007), information seeking can influence the behavior by influencing the formation of knowledge, beliefs, and attitudes regarding vaccination (Viswanath, Ramanadhan, & Kontos, 2007).

The current study investigated the factors that increase intentions to seek information about the influenza vaccine among U.S. adults. With a focus on the variables in the risk information seeking and processing (RISP) model (Griffin et al., 1999; Griffin, Dunwoody, & Yang, 2013), we surveyed a nationally representative sample of U.S. adults about their influenza and influenza vaccine-related risk perceptions and affect, information-seeking intentions, and vaccination behaviors in the 2018–2019 influenza season. The RISP model focuses on predicting information seeking in risk contexts and integrates the large evidence on behavior prediction, particularly the theory of planned behavior (TPB; Ajzen, 1991; Ajzen & Albarracín, 2007; Ajzen, Fishbein, Lohmann, & Albarracín, 2019; Albarracín, Johnson, Fishbein, & Muellerleile, 2001). The model assumes that people seek information when they perceive a need to do so (i.e., information insufficiency), inhabit normative contexts that support information seeking (i.e., positive informational subjective norms), and feel capable of seeking the information (i.e., perceived information-gathering capacity). Importantly, the model establishes that the current level of knowledge and the affect people experience when they think about a topic are the upstream antecedents of information insufficiency.

Although we focused on seeking information about the *influenza vaccine*, our measures of risk perception and affect concerned not only the influenza vaccine but influenza itself. This decision was based on the assumption that perceptions of the disease, though more distal than the perceptions of risk of the preventive behavior, are still relevant to information seeking about the behavior. In addition, we examined the applicability of the RISP model on two subpopulations; those who received the influenza vaccine in the 2018–2019 influenza season and those who did not, which allowed us to compare predictors of information-seeking intentions in these two groups. Because of our focus on these groups, our examination of affect differed from other RISP studies in that we considered anticipated affect in the unvaccinated group and experienced affect in the vaccinated group. By applying the RISP model to the specific context of the influenza vaccine and examining the generalizability of the model across two subpopulations, we sought to provide not only theoretical insights about the role of anticipated and experienced affect in the RISP model but also practical guidance about the design of interventions for different audiences.

2. LITERATURE REVIEW

2.1. RISP Model

Originally proposed as a theoretical framework that maps the antecedents of information seeking and processing in the risk communication context (Griffin et al., 1999), the RISP model (Fig. 1) has been applied to various phenomena, including climate change, obesity, sexual aggression, and presidential elections (e.g., Lu, 2015; Pokrywczynski, Griffin, & Calhoun, 2018; Yang, Chu, & Kahlor, 2018). The model's primary contribution lies in establishing new connections among well-known concepts

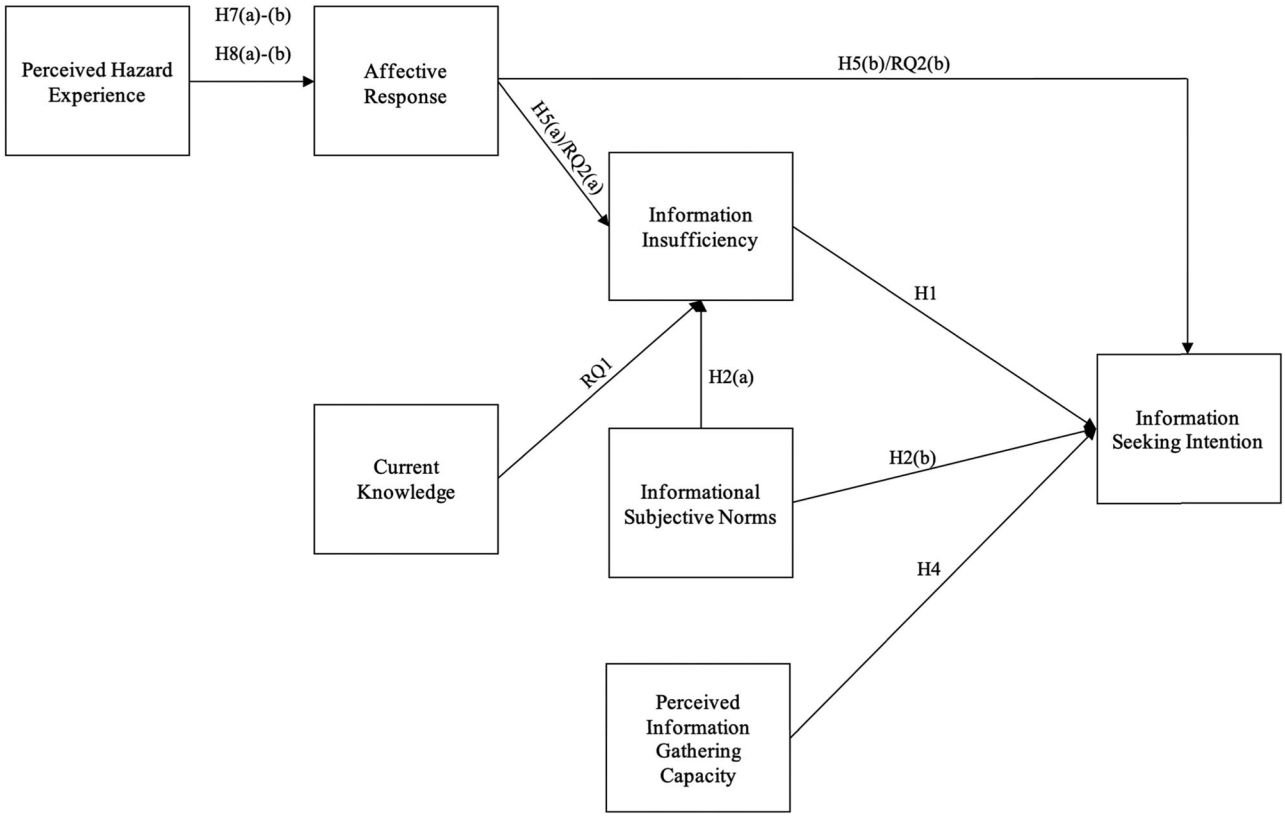

Fig. 1. Hypothesized relations in the risk information seeking and processing model.

introduced by prior theories, such as the heuristic-systemic model (HSM; Eagly & Chaiken, 1993; Johnson, Maio, & Smith-McLallen, 2005; Johnson, Wolf, Maio, & Smith-McLallen, 2019) and the TPB (Ajzen, 1991; Ajzen & Albarracín, 2007). A meta-analysis showed strong support for the utility of the RISP model in predicting information seeking and systematic processing (Yang, Aloe, & Feeley, 2014).

The current review focuses on the information-seeking part of the RISP model that is most relevant to the current study. The model considers two types of information seeking, one that is routine, occurring often through incidental exposure to information and the other that is nonroutine, representing the more active seeking of information (Griffin et al., 1999). The current study concentrates on the active side of information seeking through media and interpersonal relationships. Active information seeking generally stems from the same factors that produce systematic processing of risk information, which according to the RISP model, contributes to stable behavioral beliefs, attitudes, intentions, and behaviors regarding the risk (Dunwoody & Griffin, 2015).

The RISP model includes different motivations for risk information seeking. At their center stands a concept labeled information insufficiency. This concept originates from the HSM's propositions regarding accuracy motivation, sufficiency, and judgmental confidence (Eagly & Chaiken, 1993). According to the RISP model, people attempt to achieve a level of information that they consider sufficient to serve as the basis for their beliefs, attitudes, and behavioral intentions (Griffin et al., 1999). Naturally then, the motivation to overcome information insufficiency increases the probability of seeking more information on the topic (Griffin et al., 1999). Information insufficiency is usually conceptualized as the gap between the current knowledge level and the desired knowledge level on a topic (Griffin et al., 2013). When the desired level is higher than the actual level, information insufficiency exists. Perhaps because of different operationalizations of information insufficiency, the relation between current knowledge level and information insufficiency has been inconsistent (Griffin et al., 2008; ter Huurne & Gutteling, 2008). On the one hand, knowing more

about a topic may reduce the desire to know more because one knows enough already. On the other hand, it may further increase the desire to know more because one realizes there is much more to know. Therefore, we propose a research question:

RQ1: Does current knowledge about the influenza vaccine relate to information insufficiency regarding the influenza vaccine?

Information insufficiency can motivate people to seek more information. In contrast, when the actual level is higher than the desired level, people may feel overwhelmed and avoid new information (Griffin et al., 2013; for other conditions triggering avoidance see Albarracín & Mitchell, 2004; Cappella, Kim, & Albarracín, 2015). All in all, research has found that information insufficiency is positively associated with information seeking (Griffin et al., 2008; Lu, 2015; Yang et al., 2010).

H1: Information insufficiency will be positively related to the intention to seek information about the influenza vaccine.

Because information seeking is considered as a *behavior*, the RISP model incorporates two concepts (i.e., subjective norms and perceived behavioral control) from the TPB that are antecedents of behavioral intentions (Ajzen, 1991; Ajzen & Albarracín, 2007; Albarracín & Shavitt, 2018). Informational subjective norms in the RISP model are defined as the perceived social pressures to stay informed on a topic (Griffin et al., 1999). Similar to the concept of subjective norms, informational subjective norms can be operationalized as the combination of injunctive norms, that is, perceived others' support for information seeking, and descriptive norms, that is, perceived others' actual information seeking (Griffin et al., 2013). Research has consistently found informational subjective norms to be a direct antecedent of information seeking as well as an indirect antecedent through information insufficiency (Yang et al., 2014). Incorporating the TPB's perceived behavioral control and the HSM's concept of capacity, the RISP model defines perceived information-gathering capacity as the perceived ability to seek and process the desired information (Griffin et al., 1999; Kahlor, 2010). Research has found that the more capable of finding information people feel, the more likely they will look for it (Griffin et al., 2013).

H2: Informational subjective norms regarding the influenza vaccine will be positively related to information insufficiency (a) and information-seeking intention (b).

H3: Informational subjective norms will have an indirect, positive relation with information-seeking intention through information insufficiency.

H4: Perceived information-gathering capacity regarding the influenza vaccine will be positively related to information-seeking intention.

In addition to the three more proximal predictors of information seeking (i.e., information insufficiency, informational subjective norms, and perceived information-gathering capacity), the RISP model also considers other background predictors, including perceived hazard characteristics and affective responses to the risk, based on the risk perception literature (Griffin et al., 2013). Perceived hazard characteristics, such as risk perception, efficacy, trust, and causal attributions, are the cognitive standards used to evaluate risk, and are proposed to influence other RISP variables, such as information insufficiency and information seeking, through affective responses to the risk (Griffin et al., 2013). Research has generally supported the proposed indirect effects of perceived hazard characteristics (e.g., Griffin, Neuwirth, Dunwoody, & Giese, 2004; Yang & Kahlor, 2012). As for affective responses to the risk, the original RISP model regards this factor as working only indirectly through information sufficiency to influence information seeking (Griffin et al., 1999). However, empirical research has shown that affective responses, including both positive and negative ones, can be positively associated with information seeking in a direct fashion (Griffin et al., 2013), although the theoretical reasons for such direct relations are still unclear and being researched. Finally, we took a dimensional approach to the study of affect and regarded affective responses as either positive or negative (Cacioppo & Gardner, 1999). However, in this study, we focused on *negative* affect toward influenza because people's feelings about the diseases are largely negative (Luz, Brown, & Struchiner, 2019).

H5: Negative affect toward influenza will be positively related to information insufficiency (a) and information-seeking intention (b).

H6: Negative affect toward influenza will have an indirect, positive relation with information-seeking intention through information insufficiency.

2.2. Seeking Information About the Influenza Vaccine

When it comes to seeking information about the influenza vaccine, two RISP-based studies have examined information-seeking intentions related to the H1N1 vaccine among healthcare workers (Clarke & McComas, 2012) and college students (Yang, 2012), respectively. Despite slightly different theoretical foci and analytic approaches, each found that informational subjective norms were positively related to information-seeking intentions (Clarke & McComas, 2012; Yang, 2012). In addition, information insufficiency positively predicted information-seeking intentions, whereas perceived information-gathering capacity negatively predicted them (Yang, 2012), a finding that was uncommon in RISP studies (Griffin et al., 2013).

Given the characteristics associated with vaccines in general (e.g., concern over the safety of vaccines) and the influenza vaccine in particular (e.g., annual uptake), the probability and antecedents of seeking information about the influenza vaccine may differ from those of *risk* information seeking. To begin, it is usually the disease, such as cancer and diabetes, rather than the prevention method, that is considered risky. However, in the case of vaccines, both the disease, influenza in this case, and the prevention method, the vaccine, can be perceived as risky by some audiences. Therefore, both risk perception of and affective responses to the disease and the vaccine may also affect information seeking concerning the vaccine. In its current form, the RISP model typically considers perceptions of risk of and affective response to the hazard, in this case, influenza, but not other factors closely tied to the prevention method, in this case, the influenza vaccine.

This study tested the hypotheses that perceptions of risk of and affective responses to both influenza and the influenza vaccine will predict information seeking about the influenza vaccine. In addition, following the RISP model's rationale that risk perception works through affect, we assume that perception of influenza risk will likely influence the affect toward the influenza vaccine and that perception of the influenza vaccine risk will influence the affect related to influenza (Schmid et al., 2017). We concentrated on *positive* affect toward the influenza vaccine on the assumption that the influenza vaccine provides prevention against influenza, which likely elicits a feeling of relief and reassurance. We use the term, negative influenza-risk perceptions, to indicate the direction of this variable, that is, the higher the value, the more negative the perception of the risk is.

H7: Negative influenza-risk perceptions will be positively related to negative affect toward influenza (a) and positive affect toward the influenza vaccine (b).

H8: Negative influenza vaccine risk perceptions will be positively related to negative affect toward influenza (a) and negatively related to positive affect toward the influenza vaccine (b).

Because of the limited focus on affective responses to the prevention method in the RISP literature and their relation to information seeking, we propose the two following research questions:

RQ2: Will positive affect toward the influenza vaccine relate to information insufficiency (a) and information-seeking intention in a positive way (b)?

RQ3: Will positive affect toward the influenza vaccine have an indirect, positive relation to information-seeking intention through information insufficiency?

This study also examined vaccinated and unvaccinated people. Unlike other standard vaccines, which are once in a lifetime, the influenza vaccine is required annually (Fiore et al., 2009). As a result, information-seeking behaviors continue to be relevant to people even after being vaccinated in a particular influenza season. Admittedly, because information seeking may yield vaccination intentions or even actual behaviors, during an ongoing influenza season, vaccine information-seeking behaviors may be more important for unvaccinated people than vaccinated ones. However, information seeking can still be relevant to vaccinated groups even in the same influenza season for different reasons. For instance, a vaccinated person may intend to gather more vaccine information to persuade important others to get vaccinated. In addition, information seeking and active processing among vaccinated people may subsequently affect their vaccination intention in the next influenza season. As a result, unvaccinated and vaccinated people may seek very different information and the different information may have distinct implications for their behavior. Limited research has examined influenza vaccine information seeking based on different vaccination statuses. However, two studies, which were not based on the RISP

model, showed vaccinated people engaged in more active seeking of information (Kindratt et al., 2019; Xie et al., 2019). In the current study, we examined if the relations proposed by the RISP model differ across unvaccinated and vaccinated samples in the case of seeking influenza vaccine information.

Importantly, because our investigation focuses on two subpopulations, some variables in the RISP model may have different meanings for them. For instance, perceptions of risk of influenza and the influenza vaccine may vary across the unvaccinated and vaccinated groups. Evaluations of the influenza vaccine among unvaccinated people may depend more on what they know about the influenza vaccine, whereas evaluations among vaccinated people may depend on their actual experience with the influenza vaccine. As an exploratory step to capture this nuanced difference based on vaccination status, we conceptualized the affective response to the influenza vaccine differently for unvaccinated and vaccinated groups. For unvaccinated ones, the affective response to the influenza vaccine was measured as the anticipated affect of a person about to receive the influenza vaccine. In contrast, for vaccinated groups, the affective response was measured as the experienced affect after the person received the influenza vaccine. Research has shown that anticipated affect differs from experienced affect in its influence on vaccination intentions (Chapman & Coups, 2006). Although the RISP model specifies how affective responses to the risk influence information insufficiency and information seeking, no studies have compared the role of anticipated and experienced affect in the RISP model or in predicting vaccine information seeking. We argue that the potentially differing roles played by anticipated and experienced affect may provide a more in-depth understanding of the relation between different types of affective experiences and information seeking.

Finally, we did not have either a strong theoretical rationale or empirical evidence to predict how the relations among RISP-related variables, including anticipated- and experienced-positive affect toward the influenza vaccine, might differ across unvaccinated and vaccinated respondents. Therefore, we propose a nondirectional research question:

RQ4: Do the proposed relations in H1–H8 and RQ1–RQ3 differ among unvaccinated and vaccinated people?

3. METHODS

3.1. Participants

The data for the current study originated from a larger 6-wave panel survey assessing public opinions and attitudes of infectious diseases and vaccines. The larger panel survey was fielded to a probability-based, nationally representative sample of American adults and administered in the AmeriSpeak Panel of National Opinion Research Center (NORC) at the University of Chicago between September 2018 and September 2019. In 2018, the AmeriSpeak Panel expanded to about 30,000 households (Dennis, 2019). The AmeriSpeak Panel leverages the NORC National Frame, which covers over 97% of the U.S. households (Dennis, 2019). The AmeriSpeak panel has also been used to assess factors underlying influenza vaccination acceptance in prior research (e.g., Nowak, Cacciatore, & Len-Ríos, 2018). The survey was conducted primarily online with a small portion of respondents answering the survey over the phone. The RISP-related variables reported in the current study were from the third wave of the larger panel study (mid-January to early February 2019) and the sociodemographic variables were collected at other waves.

The original sample size was 3,005 for Wave 1. The weighted cumulative response rate for Wave 1 was 11.6%. As a result of attrition, the sample size dropped to 2,470 by Wave 2, and to 2,091 by Wave 3. At Wave 3, 1,248 had received the vaccine whereas 843 had not. The sample was 51.9% female. Also, the sample was 62.8% non-Hispanic white, 12.6% non-Hispanic black, 5.8% non-Hispanic Asian/Pacific islander, 14.3% Hispanic, 1.3% non-Hispanic other, and 3.1% non-Hispanic mixed. The mean age was 49.2 years old ($SD = 18.0$), with a median education level of an associate degree and a median household income level at $50,000–$59,999. Our sample at Wave 3 was comparable to nationwide demographics (U.S. Census Bureau, 2019) in terms of gender, age, race/ethnicity and household income. However, our sample appeared more educated than the general American public. Table I presents respondent demographics.

3.2. Measures

We adopted measures from previous research referenced in Sections 2.1 and 2.2. Table II presents all measures used in this study. The overall survey

Table I. Respondent Demographics

	Overall (%)	Unvaccinated (%)	Vaccinated (%)
Gender			
Female	51.9	53.0	51.2
Male	48.1	47.0	48.8
Age (years)			
18–24	8.9	10.3	7.9
25–44	34.9	43.1	29.5
45–64	32.0	33.6	30.9
65 and above	24.1	12.9	31.7
Race/ethnicity			
Non-Hispanic white	62.8	56.3	67.2
Non-Hispanic black	12.6	15.4	10.7
Hispanic	14.3	16.8	12.7
Non-Hispanic Asian/Pacific islander	5.8	6.2	5.5
Non-Hispanic mixed	3.1	3.2	3.0
Non-Hispanic others	1.3	2.0	0.9
Education			
Less than high school	4.1	4.0	4.1
High school equivalent	15.4	17.2	14.2
Some college/associate degree	32.1	34.9	30.2
Bachelor's degree	28.2	28.2	28.1
Graduate degree	20.3	15.7	23.4
Annual household income			
Less than $34,999	29.7	34.3	26.6
$35,000–$74,999	31.0	30.8	31.3
$75,000–$99,999	15.0	13.5	16.0
$100,000 plus	24.3	21.3	26.3

also included other measures irrelevant to this study, for instance, perceptions of risk of other diseases and vaccines (e.g., HPV, MMR vaccine, etc.). Information seeking–related measures, such as information-seeking intention, informational subjective norms, and perceived information-gathering capacity, were asked only for the influenza vaccine.

3.3. Analysis

We employed multigroup structural equation modeling (SEM) with latent and observed variables to test research questions and hypotheses, and examine the overall model fit. We used the computer software Mplus 8.1 for all analyses. Following Kline's (2016) recommendations, we used four indices to evaluate the overall model fit. First, the χ^2 goodness-of-fit statistics is reported as an index of model adequacy, where a nonsignificant value (e.g., $p > 0.05$) indicates good fit of the model to the data[1]. Second, the root-mean-square error of approximation (RMSEA) should be less than 0.05 with the lower bound 90% confidence interval (CI) below 0.05 and upper bound below 0.10. Third, the comparative fit index (CFI) should be greater than 0.95. Finally, the standardized-root-mean-square residual (SRMR) should be less than 0.08.

The vaccination behavior variable (0 = did not get vaccinated this flu season, 1 = got vaccinated this flu season) served as the grouping variable. We followed a two-step modeling procedure by constructing a measurement model first and then specifying a structural model (Kline, 2016). For the measurement model, we used the "MODEL = CONFIG METRIC SCALAR" command to compare a model that was fully unconstrained (configural), a model that constrained the factor loadings only (metric), and a model that constrained the factor loadings and intercepts (scalar). To test for measurement invariant, we relied on both χ^2 differences and CFI differences ($\leq$0.01) based on Kline's (2016) recommendations. After establishing good fit and group invariance of the measurement model, we further examined the structural model for fit and group invariance. We further improved the initial structural model by following modification indices and considering theoretical reasoning. Then to test for group invariance, we compared an unconstrained model with a model that constrained all paths. To detect which paths might have created the discrepancy between the groups, we constrained one path at a time to compare the χ^2 for the difference between the structural model and the unconstrained model. We allowed paths to be unconstrained when their χ^2 values were different from those of the unconstrained model.

Because we used the MLR command for estimation (detailed in the following section), we conducted mediation analyses using the MODEL INDIRECT command, which computes delta method standard errors for indirect effects (MacKinnon, 2008), to examine indirect effects of statistically significant sequential paths in the models.

[1]Because the χ^2 goodness-of-fit statistic is overly sensitive when sample sizes are large and performs well only when multivariate normality is assumed (Holbert & Grill, 2015), we rely more on the other three indices to assess model fit.

Table II. Descriptive Statistics and Composite Reliabilities of Survey Measures for Unvaccinated and Vaccinated Respondents

Latent Factor	Unvaccinated			Vaccinated		
Observed Indicators	*M*	*SD*	Reliability	*M*	*SD*	Reliability
Negative affect toward influenza			$r_{SB} = 0.69$			$r_{SB} = 0.63$
How afraid, if at all, do you feel about the flu? (1 = not afraid at all, 4 = very afraid)	2.22	0.87		2.39	0.88	
How disgusted, if at all, do you feel about the flu? (1 = not disgusted at all, 4 = very disgusted)	2.13	0.99		2.08	1.03	
Anticipated-positive affect toward influenza vaccine			$\alpha = 0.93$			
If you get the flu vaccine before or during this flu season, how much, if at all, do you think you will experience peace of mind? (1 = not much at all, 4 = a great deal)	2.28	0.95				
If you get the flu vaccine before or during this flu season, how much, if at all, do you think you will experience feeling relief? (1 = not much at all, 4 = a great deal)	2.24	0.92				
If you get the flu vaccine before or during this flu season, how much, if at all, do you think you will experience feeling hopeful? (1 = not much at all, 4 = a great deal)	2.23	0.93				
Excluded: If you get the flu vaccine before or during this flu season, how much, if at all, do you think you will experience feeling scared? (1 = not much at all, 4 = a great deal) (reverse coded)	3.02	0.93				
Experienced-positive affect toward influenza vaccine						$\alpha = 0.87$
Ever since you got the flu vaccine this flu season, how much if at all, did you experience peace of mind? (1 = not much at all, 4 = a great deal)				3.24	0.81	
Ever since you got the flu vaccine this flu season, how much if at all, did you experience feeling relief? (1 = not much at all, 4 = a great deal)				3.05	0.89	
Ever since you got the flu vaccine this flu season, how much if at all, did you experience feeling hopeful? (1 = not much at all, 4 = a great deal)				2.98	0.90	
Excluded: Ever since you got the flu vaccine this flu season, how much if at all, did you experience feeling scared? (1 = not much at all, 4 = a great deal) (reverse coded)				3.57	0.70	
Informational subjective norms			$r_{SB} = 0.91$			$r_{SB} = 0.84$
Think about the people who are important to you. How likely, if at all, are they to look for information about the flu vaccine? (1 = not likely at all, 4 = very likely)	1.96	0.86		2.07	0.90	
Think about the people who are important to you. How likely, if at all, are they to want you to look for information about the flu vaccine? (1 = not likely at all, 4 = very likely)	1.87	0.87		1.97	0.90	
[Observed variables included independent from latent factors]						
Negative influenza risk perception was calculated based on the multiplication of perceived susceptibility and perceived severity (detailed items listed below). Perceived susceptibility was calculated as the average of perceived self-susceptibility and perceived other-susceptibility.	6.71	2.94		7.22	2.94	
Perceived self-susceptibility: Just your best guess, how likely, if at all, do you think you are to get infected with the flu this flu season? (1 = not likely at all, 4 = very likely or already had the flu)	2.07	0.81		2.03	0.74	
Perceived other-susceptibility: Just your best guess, how likely, if at all, do you think people important to you are to get infected with the flu this flu season? (1 = not likely at all, 4 = very likely or already had the flu)	2.29	0.82		2.38	0.83	

(*Continues*)

Table II. Continued

Latent Factor	Unvaccinated			Vaccinated		
Observed Indicators	*M*	*SD*	Reliability	*M*	*SD*	Reliability
Perceived severity: Just your best guess, how severe (e.g., life threatening, causing major illness), if at all, do you think complications from the flu can be? (1 = not severe at all, 4 = very severe)	3.04	0.81		3.27	0.89	
Negative influenza vaccine risk perception: Just your best guess, how risky, if at all, do you think the flu vaccine is? (1 = not risky at all, 4 = very risky)	2.51	0.82		1.85	0.76	
Current knowledge: How much do you think you know about the flu vaccine? (1 = not much at all, 4 = a great deal)	2.66	0.76		2.89	0.72	
Information insufficiency: How much more, if at all, do you think you need to know about the flu vaccine? (1 = no more than what I currently know, 4 = a lot more)	1.78	0.96		1.76	0.95	
Perceived information-gathering capacity: How difficult or easy is it for you to find information about the flu vaccine? (1 = very difficult, 4 = very easy)	3.62	0.58		3.54	0.65	
Information seeking intention: How likely, if at all, are you to look for information about the flu vaccine in the next month? (1 = not likely at all, 4 = very likely)	1.69	0.79		1.72	0.87	

Note: Observed indicators were excluded if their latent factor loadings <0.45 and when composite reliabilities were calculated.

4. MODEL FITTING RESULTS

4.1. Measurement Model

4.1.1. Data Screening

We first screened data for collinearity, normality, and missing values. Collinearity was not a concern for both unvaccinated and vaccinated groups because all tolerance values were above 0.10 and variance inflation factor (VIF) values were below 10 (Kline, 2016). We used Stata 14 to test for multivariate normality in both unvaccinated and vaccinated groups. The results suggested possible violations of the multivariate normality assumption of a standard maximum likelihood estimator (i.e., skewness > |3| and kurtosis > |20|; Kline, 2016). Therefore, we employed a maximum likelihood estimator with robust standard error (MLR) implemented by Mplus 8.1 because this method is robust to nonnormality. Concordantly, the χ^2 test was corrected (Yuan & Bentler, 2000). Finally, missing values were handled using the full information maximum likelihood estimation.

4.1.2. Forming a Suitable Measurement Model

Before constructing the full structural models, we first built measurement models of all latent variables: Negative affect toward influenza, anticipated-positive affect toward the influenza vaccine (in the unvaccinated sample only) or experienced-positive affect toward the influenza vaccine (in the vaccinated sample only), and informational subjective norms.

The unconstrained measurement model (configural) fit the data well: χ^2 (22) = 47.832, p = 0.001, RMSEA = 0.034 (90% CI = 0.020–0.047), CFI = 0.994, SRMR = 0.018. The measurement model (metric) with constrained factor loadings also fit the data well: χ^2 (26) = 65.972, p < 0.001, RMSEA = 0.038 (90% CI = 0.027–0.050), CFI = 0.991, SRMR = 0.029. However, the measurement model (scalar) with constrained factor loadings and intercepts did not fit the data well: χ^2 (30) = 126.947, p < 0.001, RMSEA = 0.056 (90% CI = 0.046–0.066), CFI = 0.977, SRMR = 0.046. Thus, we focused on comparing the first two measurement models (configural and metric). Although χ^2 values of the two measurement models were significantly different, the difference in their CFI values was smaller than 0.01, suggesting measurement invariance (Cheung & Rensvold, 2002). Therefore, the measurement model with constrained factor loadings was used as the basis for the structural model.

4.2. Structural Model

We constructed the multigroup structural models based on the hypothesized model shown in Fig. 1.

The initial structural model with factor loadings unconstrained did not fit the data well: χ^2 (100) = 529.606, $p < 0.001$, RMSEA = 0.064 (90% CI = 0.059–0.070), CFI = 0.940, SRMR = 0.081. We then refined the model based on modification indices, theoretical reasoning, and empirical support from previous RISP studies. First, we added covariance between the error terms of two observed variables, that is, hope and relief, because these two items were indicators of the same latent variable (positive affect) and highly correlated. Second, we added a path from perceived information-gathering capacity to information insufficiency. This relation was found in prior research using an adapted RISP model that showed that perceived need for information depended partly on the perceived self-efficacy of information seeking (Kahlor, 2010). Kahlor (2010) explained that based on the extended parallel process model (EPPM), an individual who deals with a risk may make threat- and efficacy-related judgments after exposure to a risk message, and may also assess whether additional information is necessary. Third, we added a path from informational subjective norms to positive affect. Prior RISP research has found this association (e.g., Yang et al., 2010), and it is consistent with the notion that emotions can serve to encourage people to follow subjective norms (Onwezen, Antonides, & Bartels, 2013). Fourth, for the vaccinated group only, we added a path from current knowledge to information-seeking intentions. Prior research, including a meta-analysis of RISP models (Yang et al., 2014), has suggested that current knowledge may be an indicator of issue involvement, which in turn motivates more information seeking (ter Huurne & Gutteling, 2008). Fifth, for the vaccinated group only, we added a path from current knowledge to positive affect toward the influenza vaccine. These two variables have been found to correlate in previous research (e.g., Yang et al., 2010), and the path is consistent with the idea that knowledge about an issue can shape affect toward the issue to further influence behavioral intentions (Carmi, Arnon, & Orion, 2015). Finally, for the unvaccinated group only, we added a path from negative influenza vaccine risk perception to information insufficiency. This path implies that, rather than working through affective responses, negative influenza vaccine risk perceptions may increase the need for more vaccine information in a direct fashion (Griffin et al., 2004). After these modifications, the fit of the structural model improved: χ^2 (91) = 312.397, $p < 0.001$, RMSEA = 0.048 (90% CI = 0.042–0.054), CFI = 0.969, SRMR = 0.055. However, these additional paths should still be interpreted with caution and treated as exploratory because they were not part of the original RISP model.

We then constrained all paths in this structural model. The fit of the resulting model became significantly worse relative to the model with all paths unconstrained: χ^2 (106) = 391.696, $p < 0.001$, RMSEA = 0.051 (90% CI = 0.045–0.056), CFI = 0.960, SRMR = 0.067. Following the steps described in the analysis section, we constrained six paths in the structural model, resulting in a final model that fit the data well: χ^2 (97) = 316.787, $p < 0.001$, RMSEA = 0.047 (90% CI = 0.041–0.052), CFI = 0.969, SRMR = 0.055. Overall, this final model explained 42% and 38% of the variance in information-seeking intention among unvaccinated respondents and vaccinated respondents, respectively.

5. RELATION TESTING RESULTS

Figs. 2 and 3 present unstandardized and standardized (in parentheses) coefficients for hypothesized relations (solid lines) between RISP variables as well as additional ones (dotted lines) after model modification. The variables were scaled so that a positive coefficient means a positive association and a negative coefficient means a negative association, corresponding to the hypothesized relations in Sections 2.1 and 2.2. Bolded lines in the figures represent hypothesized relations that were supported. In summary, H1, H2(a)–(b), H5(b), H7(a), and H8(a)–(b) were supported in both samples. Specifically, in both samples, information insufficiency was positively related to information-seeking intention (H1); informational subjective norms were positively related to information insufficiency (H2a) and information-seeking intention (H2b); negative affect toward influenza was positively related to information-seeking intention (H5b); negative influenza-risk perceptions were positively related to negative affect toward influenza (H7a); negative influenza vaccine risk perceptions were positively related to negative affect toward influenza (H8a) and negatively related to positive affect toward the influenza vaccine (H8b). In contrast, H4 was rejected in both samples. That is, perceived information-gathering capacity was negatively related to information-seeking intention (H4).

The two samples also differed in that H5(a) was rejected for the unvaccinated respondents but supported for the vaccinated respondents, whereas H7(b) was supported for the unvaccinated respondents but rejected for the vaccinated respondents.

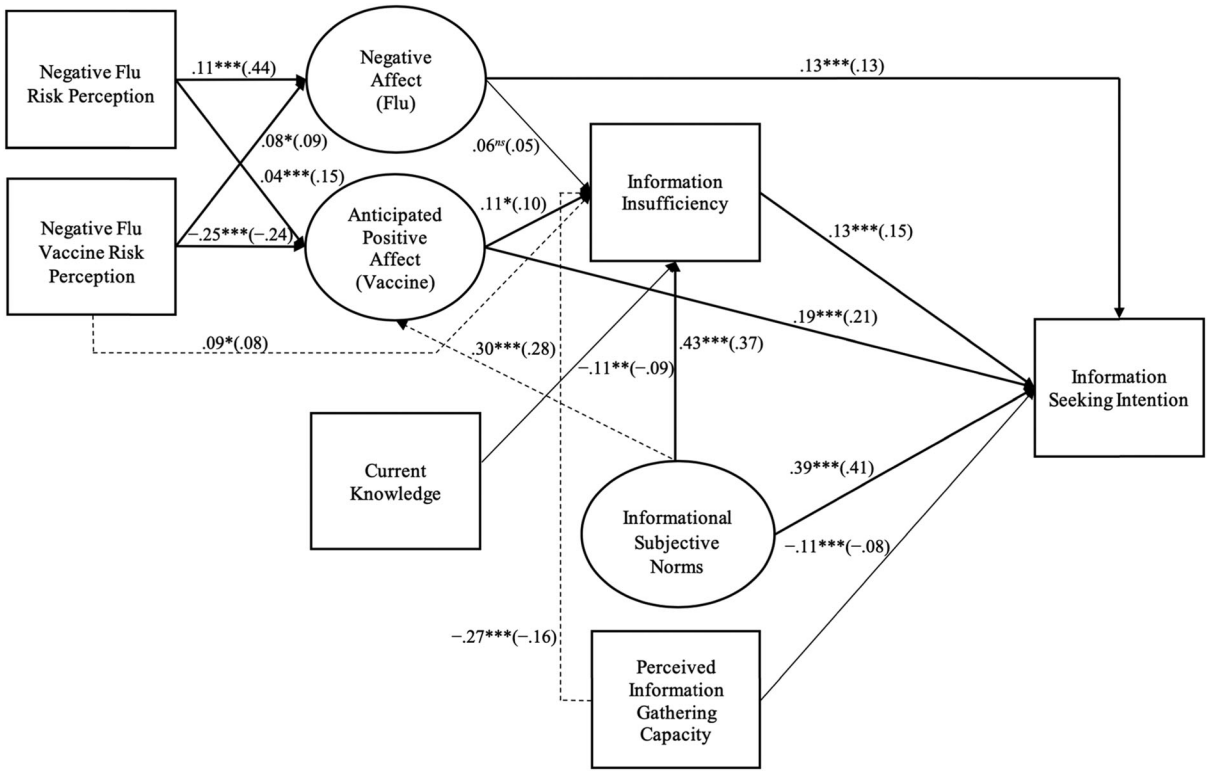

Fig. 2. Final structural model for unvaccinated respondents.
Note: Unstandardized and standardized (in parentheses) coefficients are reported. Covariances between exogenous variables are not shown. Solid lines are hypothesized relations and dotted lines are relations added after model modification. Bold lines represent hypothesized relations that are supported. $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$. *ns* = nonsignificant.

Specifically, negative affect toward influenza had no significant relation with information insufficiency in the unvaccinated sample but had a positive relation in the vaccinated sample (H5a). Moreover, negative influenza-risk perceptions had a positive relation with anticipated positive affect toward the influenza vaccine but no significant relation with experienced positive affect toward the influenza vaccine (H7b).

In addition, for RQ1, current knowledge showed a negative relation with information insufficiency in the unvaccinated sample but no significant relation in the vaccinated sample. Furthermore, for RQ2(a), anticipated positive affect toward the influenza vaccine was positively related to information insufficiency, whereas experienced positive affect toward the influenza vaccine had no significant relation with information insufficiency. Finally, for RQ2(b), both anticipated and experienced positive affect toward the influenza vaccine were positively related to information-seeking intention.

With respect to our hypotheses and research question regarding indirect effects, we first found that information insufficiency did not mediate the relation between negative affect toward influenza and information-seeking intention in the unvaccinated sample ($B = 0.01$, $SE = 0.01$, $p = 0.267$; $\beta = 0.01$). In contrast, information insufficiency did mediate the relation between negative affect toward influenza and information-seeking intention in the vaccinated sample ($B = 0.05$, $SE = 0.01$, $p < 0.001$; $\beta = 0.04$). Thus, H6 was rejected in the unvaccinated sample but supported in the vaccinated sample.

Second, to answer RQ3, we found that information insufficiency was a mediator of the relation between anticipated-positive affect toward the influenza vaccine and information-seeking intention in the unvaccinated sample ($B = 0.01$, $SE = 0.01$, $p = 0.025$; $\beta = 0.02$). In contrast, this mediation was not verified in the vaccinated sample ($B = -0.01$, $SE = 0.01$, $p = 0.578$; $\beta = -0.00$).

Finally, we found that information insufficiency positively mediated the relation between informational subjective norms and information-seeking intention in the unvaccinated sample ($B = 0.05$, SE

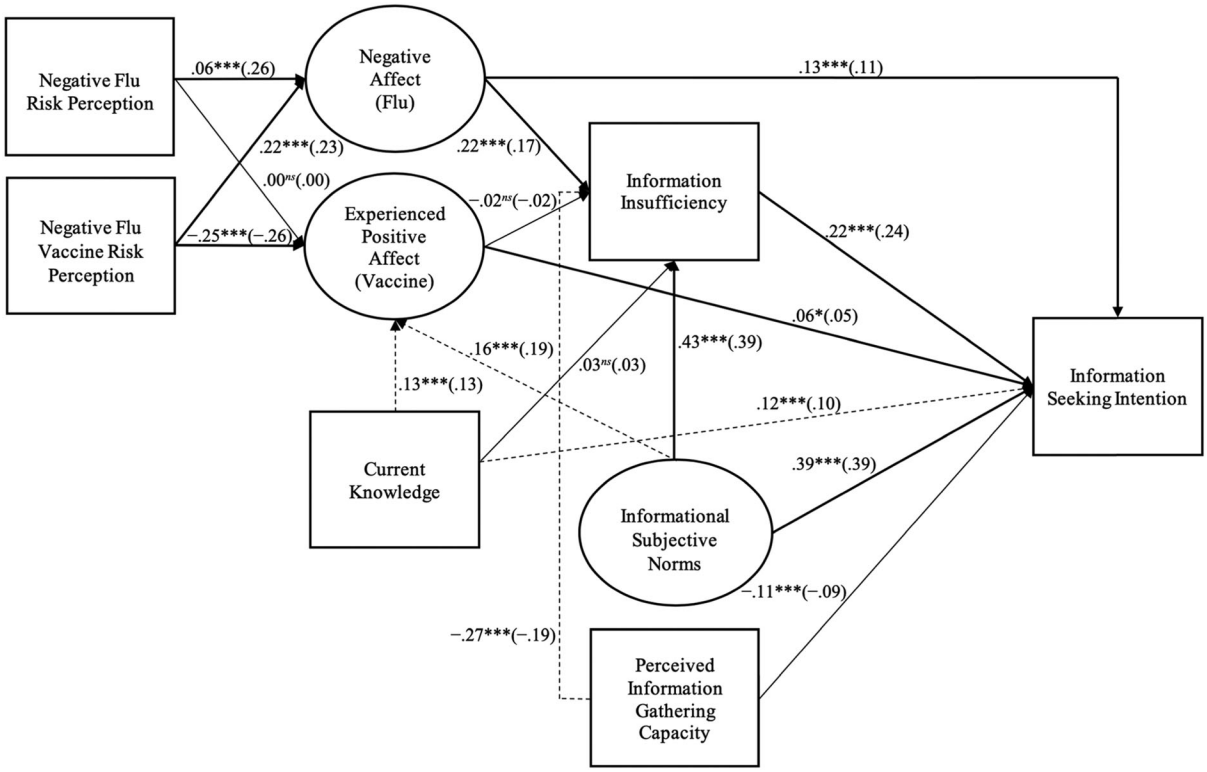

Fig. 3. Final structural model for vaccinated respondents.
Note: Unstandardized and standardized (in parentheses) coefficients are reported. Covariances between exogenous variables are not shown. Solid lines are hypothesized relations and dotted lines are relations added after model modification. Bolded lines represent hypothesized relations that are supported. $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$. *ns* = nonsignificant.

= 0.01, $p < 0.001$; $\beta = 0.06$) and in the vaccinated sample ($B = 0.09$, $SE = 0.01$, $p < 0.001$; $\beta = 0.09$). Hence, H3 was supported in both samples.

6. GENERAL DISCUSSION

We started the current study with the primary objective of mapping out the predictors of the intention to seek information about the influenza vaccine. Surveying a nationally representative sample of U.S. adults during the 2018–2019 influenza season, we examined various motivational factors primarily proposed in the RISP model. Overall, we found evidence supporting the utility of applying the RISP model to explain information-seeking intention in the influenza vaccine context. The current study makes theoretical and empirical contributions to the literature and practice in a number of ways. Primarily, the current study not only applied but also extended the RISP model to the influenza vaccine context, including its focus on two subpopulations, explored the role of influenza and influenza vaccine-related risk perception and affect, and differentiated between anticipated and experienced affect.

Unlike the broader vaccine literature that focuses heavily on vaccination uptake (Schmid et al., 2017; Yeung, Lam, & Coker, 2016), we focused on vaccine information seeking in the current study. This area deserves more attention (Kindratt et al., 2019; Xie et al., 2019) because information seeking and processing can serve as an important antecedent of actual behavioral change (Griffin et al., 1999). Though changes in vaccination behaviors may be the ultimate goal, knowledge about this understudied antecedent (i.e., information seeking) is essential to providing a more complex picture of the relation between communication processes and vaccination behaviors (Viswanath et al., 2007). This research is especially crucial in the context of the influenza vaccine that requires receiving the vaccine annually (Fiore et al., 2009) and therefore seeking information about it on a regular basis. Additionally, lack of knowledge and misconceptions about influenza and the influenza vaccine hinder vaccine uptake (Nowak

et al., 2015; Wheelock, Thomson, & Sevdalis, 2013) and may be offset by exposure to information (Shah, 2017). Therefore, information seeking may represent an initial step in the long process that starts with changing knowledge and progresses to behavioral change (Viswanath et al., 2007).

On the whole, we found that the RISP model applied well to both unvaccinated and vaccinated populations. Apart from a few distinct differences, the patterns of the predictors of information seeking were largely comparable across the two groups. In both groups, informational subjective norms, information insufficiency, negative affect toward influenza, and positive affect toward the influenza vaccine emerged as proximal predictors of seeking information about the influenza vaccine. Importantly, many of the information-seeking predictors examined in this study were also found to be important predictors of the influenza vaccine uptake (Schmid et al., 2017; Yeung et al., 2016), which offers further support for the idea that seeking information about the influenza vaccine may function as an intermediary step toward changes in vaccination behaviors.

Supporting the RISP model's proposition, information insufficiency, as a representation of accuracy motivation, was associated positively with information-seeking intention in both samples. In contrast, the role of current knowledge differed across the two samples. Current knowledge was negatively related to information insufficiency in the unvaccinated sample and was not associated with information insufficiency in the vaccinated sample. Instead, current knowledge level had a direct, positive relation with information-seeking intention in the vaccinated sample. It should be noted that our operationalization of information insufficiency differed from many RISP studies, which employed an information sufficiency threshold as part of their information insufficiency measure (Yang et al., 2014). In comparison, we operationalized the same concept as need for more information, which showed no significant relations with current knowledge (ter Huurne & Gutteling, 2008; ter Huurne, Griffin, & Gutteling, 2009). In addition, our measure of need for more information was fairly vague, which might not capture nuances of judgmental confidence, satisficing accuracy, and topical specificity (Eagly & Chaiken, 1993). Relying on other RISP research (e.g., Pokrywczynski et al., 2018), a better framing of our measure might be: "How much more, if at all, do you think you need to know about the flu vaccine *to deal adequately with the possible risks from the flu*?" These differences in operationalization might account for the unexpected results. In addition, the current findings may also be attributable to the different meanings of current knowledge as a result of vaccination status. Vaccinated people's experience with the influenza vaccine during the present season is likely to become a part of their current knowledge. This experience-based knowledge was different from the perceived knowledge of the unvaccinated respondents and played a more direct role in influencing subsequent information-seeking intentions. The direct, positive relation between current knowledge and information-seeking intention was also found in prior research (e.g., Yang et al., 2010). This relation may be explained by the intervention of perceived information gathering capacity (Dunwoody & Griffin, 2015; Griffin et al., 2013). Perhaps people who have sought information about the influenza vaccine in the past (current knowledge) now have a greater capacity to seek further information about the influenza vaccine.

Regarding the two variables adapted from TPB, informational subjective norms turned out to be the strongest predictor of information-seeking intention in both samples, supporting its key role in the RISP model (Yang et al., 2014). In addition, as proposed in the original RISP model (Griffin et al., 1999), information subjective norms also worked through information insufficiency to influence information-seeking intention. Interestingly, perceived information-gathering capacity showed a negative relation with information-seeking intention, which was opposite to what was predicted in the RISP model. Similar relations were found in other RISP studies (Kahlor, 2010; Yang & Kahlor, 2012). This unexpected relation may have emerged because of the way perceived information-gathering capacity was measured in our study. Our measure represented an external locus of control, meaning that individuals are subject to the availability of the information instead of experiencing an internal locus of control and perceived self-efficacy (Dunwoody & Griffin, 2015). With our current measure, respondents who thought that finding influenza vaccine information was easy did not intend to look for information because they could get such information whenever they wanted. Measures that reflect internal locus of control (e.g., Griffin et al., 2008) may be conceptually more suitable for the RISP model (Dunwoody & Griffin, 2015) and thus should be adopted in the future.

A major contribution of the current study is its consideration of the two types of risk perception and affect. The RISP model usually takes into account

the risk perception and affect associated with the hazard, which is influenza, in this case (Griffin et al., 1999). However, we also included in the SEM model risk perception and affect related to the influenza vaccine. We expected that risk perception and affect related to influenza and the influenza vaccine would influence each other, which was largely supported in our findings. The exception was that influenza risk perception was not significantly associated with experienced-positive affect in the vaccinated sample. It is likely that vaccinated respondents believed that their getting the influenza vaccine could protect them from influenza. Therefore, the positive affect they experienced after getting the influenza vaccine became unrelated to how risky they perceived influenza to be. Moreover, negative affect toward influenza was directly related to information-seeking intention in both samples. Negative affect toward influenza was also indirectly related to information-seeking intention through information insufficiency in the vaccinated sample. These results suggest that even though risk perception and affect regarding influenza were not the same as risk perception and affect regarding the influenza vaccine, they did influence information-seeking intention regarding the influenza vaccine through indirect or direct pathways.

In addition, because of our focus on two groups differing in their vaccination status, we conceptualized and operationalized affective response to the influenza vaccine differently across the two groups. First, in the unvaccinated group, positive affect was directly related to information-seeking intention and indirectly via information insufficiency. In fact, anticipated-positive affect was the second strongest predictor of information-seeking intention after information subjective norms. This finding is consistent with another RISP study showing a positive relation between optimistic feelings and seeking information about enrolling in clinical trials (Yang et al., 2010). According to the mood-as-a-resource hypothesis, the positive affect respondents anticipated can serve as psychological buffer that may help them cope with self-relevant negative information, in this case, the influenza vaccine information, which can be potentially negative (Trope, Ferguson, & Raghunathan, 2001). Therefore, this anticipated positive affect could motivate further information seeking. Second, the positive relation between informational subjective norms and anticipated- and experienced-positive affect was not expected, despite some correlational evidence in other RISP studies (e.g., Yang et al., 2010). Unvaccinated and vaccinated respondents who felt more social pressure to be informed about the influenza vaccine tended to anticipate or experience more positive affect after getting the influenza vaccination. Although our items did not specify seeking positive or negative influenza vaccine information, the direction of the relation between informational subjective norms and anticipated- or experienced-positive affect suggests that the felt social pressure came primarily from important others who supported influenza vaccination. Third, in the vaccinated group, experienced-positive affect was not only unrelated to information insufficiency but also had a weaker direct relation with information-seeking intention compared with the unvaccinated group. These findings suggest that the affect that respondents anticipated to feel before engaging in a behavior motivated the intention to seek information about the behavior more than did the affect that they actually experienced after engaging in the behavior.

Of note, we did not test the full RISP model. One important RISP variable that we did not examine is relevant channel beliefs, defined as a person's beliefs about the information channels that might be used for information, and proposed as a predictor of information seeking (Griffin et al., 1999). In the few RISP studies that directly tested the role of relevant channel beliefs in influencing information seeking, inconsistent findings emerged, calling for more consistent conceptualization and operationalization of this variable (Dunwoody & Griffin, 2014; Griffin et al., 2013; see also Moyer, Griffin, & Pokrywczynski, 2019). In relation to the influenza vaccine literature, research has consistently shown that healthcare providers remained the most used and trusted sources of influenza vaccine information (Nowak et al., 2018; Schmid et al., 2017). Family members and close friends have also been regarded as important information sources of influenza vaccine information (Wheelock et al., 2013; Yeung et al., 2016). These relevant sources and channels should be examined in the future. In addition, the original formulation of the RISP model also proposed that risk information seeking and processing should be most directly influenced by the interactions of motivations (information insufficiency, affective responses to the hazard, and informational subjective norms), perceived information gathering capacity, and relevant channel beliefs (Griffin et al., 1999). We did not look into the proposed interaction effects in our study due to the already sophisticated nature of the model and the lack of a measure of relevant channel beliefs. Research

should explore the proposed interaction effects in the future.

Coming back to the "so what" question of our study, the original RISP model also includes a TPB-based segment linking information seeking and especially processing to the various downstream variables proposed in the TPB (Griffin et al., 1999). The RISP model specifically proposes that systematic processing of risk information can lead to more stable behavioral beliefs, attitudes, behavioral intentions, and behaviors (Griffin, Neuwirth, Giese, & Dunwoody, 2002). Relatedly, although we consider the investigation of risk perceptions and affect regarding the influenza vaccine a contribution to the risk information-seeking literature, these two concepts may also be measured via behavioral beliefs directly influencing vaccination attitudes, intentions, and behaviors, as proposed in the TPB. Future research should examine the role of information seeking and processing, the latter of which was not investigated in this study, in influencing the content and stability of behavioral beliefs (e.g., vaccine risk perception and affect toward vaccines, etc.). Future research should also address other more downstream TPB-based factors concerning vaccination behaviors, which will make a valuable contribution to connecting the information-seeking literature in general and the RISP research specifically with the broader literature on the influenza vaccine uptake (Schmid et al., 2017; Yeung et al., 2016).

Although the current study was guided by a theoretical framework and empirical evidence, it has its limitations. First, the use of SEM often conveys the false notion of causality. Although our SEM models were constructed based on the RISP model, our survey data were cross-sectional in nature, meaning that the direction of the pathways presented in the models could not be determined precisely by the current data. Longitudinal data or experimental data manipulating some of the RISP constructs may be more suitable to establish causality and pinpoint the direction of various pathways. Second, because influenza is a seasonal disease, we need to consider the influence of the timing of data collection. For instance, we conducted the survey containing the core RISP variables in the middle of an influenza season. Thus, although collecting data in the middle of an influenza season allowed us to have a sufficient sample of both unvaccinated and vaccinated respondents, our findings might be different if the same questions were asked at the beginning or end of an influenza season or outside an influenza season. Future research may collect data at different time points to investigate whether the relations among variables differ across time. Third, as briefly mentioned earlier, the positivity or negativity of the influenza vaccine information was not specified in the survey. Although some people may look for anything related to influenza vaccine information, others may intentionally seek specific information concerning risks or side effects of vaccination. Our current survey used the general term "flu vaccine information," which might have resulted in different findings than when "side effects of flu vaccine information" or "benefits of flu vaccine information" are used. Future research may explore these possibilities and compare data patterns when respondents answer questions about seeking information that emphasizes different aspects of the influenza vaccine.

Finally, the findings from the current study can have practical implications for how interventions can be designed to encourage audiences to seek information about the influenza vaccine. First, because of the crucial role played by informational subjective norms, it is important to create a social environment where seeking influenza vaccine information is of value. For instance, utilizing the functions (e.g., like, share, etc.) of social media platforms to produce an impression that seeking influenza vaccine information is the norm among peers is likely to encourage audiences to follow suit. Second, with regard to information insufficiency, emphasizing the need to know more about the influenza vaccine than one already knows seems important. Stimulating curiosity about the influenza vaccine may be an effective strategy. Also, because healthcare providers remain the most trusted source of influenza vaccine information (Nowak et al., 2018; Schmid et al., 2017), they could take on a more active role, including the use of healthcare providers in media messages or in direct interactions to increase patients' knowledge. Third, in relation to negative affect toward influenza, carefully designed emotional appeals that highlight the negative consequences of contracting influenza and elicit negative affect toward influenza seem potentially beneficial (see Earl & Albarracín, 2007; Tannenbaum et al., 2015). Fourth, messages that highlight the positive feelings that people may associate with vaccination are likely to be efficacious. As the use of images is an effective tool for eliciting positive and negative affect (Leiserowitz, 2006), emotional appeals may incorporate relevant images to induce affective responses. Although some evidence exists supporting the value

of these recommended approaches, future research should further investigate their effectiveness and practicality before actual interventions are designed.

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