RESEARCH ARTICLE

Factors Influencing Intention to Undertake Nasopharyngeal Cancer Risk Reducing Behaviors

Su-Hie Ting*, Rayenda Khreshna Brahmana, Collin Jerome, and Yuwana Podin
Universiti Malaysia Sarawak, Kota Samarahan
*shting@unimas.my

Abstract: To reduce deaths due to nose and throat cancer, also known as nasopharyngeal cancer (NPC), it is important to understand factors that motivate the public to undertake cancer screening. This study employed the risk perception attitude (RPA) framework to predict factors influencing NPC risk-reducing behaviors among a group of Malaysians. A sample of Malaysians (n=215) completed a questionnaire about perceived susceptibility, perceived severity, self-efficacy, response efficacy, and intention to enact self-protective actions to reduce NPC risk. A majority of the participants had responsive (high risk, high efficacy) and proactive attitudes (low risk, high efficacy). Hierarchical regression of mediation effect under structural equation model (SEM) approach was used to test the theory. Response efficacy and self-efficacy were negatively associated with perceived risk ($p<0.01$). Intention was negatively associated with perceived risk and positively associated with response efficacy and self-efficacy ($p<0.01$). Heightened perceived risk weakens efficacy beliefs and intention to enact self-protective behavior, suggesting that low-risk messages may work better to avert fatalistic thinking for this group. Perceived risk and response efficacy explained 26.5% of the variance in self-efficacy, suggesting the importance of framing NPC risk messages to heighten the audience's confidence to enact self-protective health behaviors.

Keywords: Nasopharyngeal cancer, Risk Perception Attitude framework, risk-reducing behaviors, Malaysians

Nose and throat cancer, also known as nasopharyngeal cancer (NPC), when diagnosed before Stage 3, has good prognostic outcomes. Considering that NPC is sensitive to chemo-radiotherapy and results in a two- and three-year survival rate of 84% and 78%, respectively, in cases of early detection (Fles et al., 2016), regular screening is important to reduce mortality. Worldwide, deaths due to NPC number 50,000 out of 86,000 cases (Parkin et al., 2005), and 71% of new NPC cases are from East and Southeast Asia (Chang & Adami, 2006). In Malaysia, NPC is the fifth most common cancer, and the lifetime risk for males was 1 in 143, and it was 1 in 417 for females in the 2007–2011 period (Ministry of Health, Malaysia, 2015). Most of the NPC cases were detected at Stages 3 and 4 (63% for males, 60% for females) (Ministry of Health, Malaysia, 2017), suggesting a lack of awareness towards NPC symptoms.

Minimizing risk factors can reduce NPC deaths. It is widely reported among NPC researchers that

Epstein-Barr virus infection, smoking, and frequent consumption of preserved food and salted fish are associated with a high incidence of NPC (Chua et al., 2016). Non-environmental risk factors of NPC include gender, ethnicity, and family history (Fles et al., 2010). Certain ethnic groups such as the Bidayuh (Devi et al., 2005), Cantonese (Wee et al., 2010), and Malaysian residents in Sarawak, Penang, and Labuan have higher NPC incidences (Ministry of Health, Malaysia, 2017). Exposure to formaldehyde, wood dust, smoke, and chemicals may also be involved in the pathogenesis of NPC (Mahdavifar et al., 2016). Awareness of NPC risk factors can lead to the adoption of risk-reducing behaviors such as screening and reduced intake of NPC-causing foods. However, taboos surrounding cancer discourage screening for early cancer detection (Banning & Hafeez, 2010; O'Callaghan et al., 2016; Ting et al., 2018). However, little is known about NPC risk-reducing behaviors and factors that predict these behaviors among Malaysians. Thus far, research on NPC in Malaysia is mostly clinical studies on the epidemiology of NPC (Aziz et al., 2017; Prasad & Rampal, 1992; Tarone et al., 1990; Teoh et al., 2014; Tiong & Selva, 2005; Yu et al., 1985). Some studies examined the knowledge of the primary care doctors on NPC (Balachandran et al., 2012) and the social impact of NPC (Armstrong et al., 2000). The present study is the first to investigate individuals' reasons for enacting preventive or self-protective measures to reduce risk in a setting where the incidence of NPC deaths is high: NPC ranks number five in cancer incidences in Malaysia (Ministry of Health, Malaysia, 2015). This study aimed to employ the risk perception attitude (RPA) framework to predict NPC risk-reducing behaviors among a group of Malaysians.

Risk Perception Attitude Framework

The RPA framework was developed by Rimal and Real (2003) based on Witte's (1994) extended parallel process model to understand the relationship between health risk perceptions and health behaviors, moderated by their efficacy beliefs. Risk perception is related to beliefs about perceived severity and perceived susceptibility, whereas risk prevention behavior is related to efficacy beliefs, operationalized as the product of self-efficacy and response efficacy. Health behaviors refer to self-protective measures that individuals can take or intend to take to avoid certain diseases, including information-seeking behaviors. Based on their risk perceptions and efficacy beliefs, individuals are categorized into one of the four attitudinal groups: responsive (high risk, high efficacy), avoidance (high risk, low efficacy), proactive (low risk, high efficacy), and indifference (low risk, low efficacy). Their non-intervention study on skin cancer-related behaviors showed that the responsive group reported healthier outcomes than the avoidance group, and the proactive group reported healthier outcomes than the indifferent group (Rimal & Real, 2003).

The use of RPA has identified diverse risk factors influencing behavioral health intentions. For example, people who reported high levels of perceived cancer risk and strong self-efficacy were more motivated and able to engage in various health actions such as cancer-prevention diets (Sullivan et al., 2008), information seeking on cancer, and cancer screening (Rimal & Juon, 2010; Wong, 2009, 2012). Besides efficacy beliefs, other studies found that non-environmental risk factors moderated breast cancer risk perceptions and intention to undergo mammography screening such as rural-urban locality, religion, social-cultural beliefs (Allo et al., 2019), family history (Chen & Kaphingst, 2011), age (Hanoch et al., 2016), and health literacy (Peters et al., 2007). Spiritual health's locus of control, for example, influenced American women's perceived risk and efficacy, which resulted in several health outcomes: message acceptance, talking about breast cancer, information seeking, and behavioral intentions (Leshner et al., 2006). In addition, "cancer fatalism, low self-efficacy mistrust of health care providers, and previous negative experiences with the medical system have all been associated with decreased cancer screening" and adherence to health care recommendations (Morris et al., 2013, p. 225). In their review of the field, they concluded that the causal relationship between people's health risk perceptions and their health behaviors is "more tenuous" than expected, given the "discrepanc(ies) in (research) findings," whereas some studies found a positive connection between people's perceptions of health risks and their health-related precautionary behavior, others discovered otherwise (Rimal & Juon, 2010). They further argued that the causes for these discrepancies could be attributed to researchers' own failure to take into account the various moderators that may influence the causal link between risk perception and health behavior. Consistent with the RPA and the

findings of studies that have employed this framework, we hypothesize that efficacy beliefs, in addition to various modifying factors, will predict NPC risk-reducing behaviors.

Methods

Participants and Procedure

Eligible participants were Malaysian residents ages 15 or older from various ethnic and socioeconomic status groups. Given that the focus of the larger study was to investigate NPC risk-reducing behaviors and factors that predict these behaviors, Malaysians with and without the experience of NPC were eligible to be enrolled in the study. Based on the general rule, the minimum number of respondents or sample size is a five-to-one ratio of the number of independent variables to be tested. However, Hair et al. (2010) proposed that the acceptable ratio is ten-to-one. In the end, our sample size was 215 respondents. As we could not get a list of all the elements of the population, we used a non-probability purposive sampling. The characteristics of 215 participants are reported in Table 1.

The objective of the study was explained to eligible Malaysian residents who agreed to participate. Enumerators administered the written informed consent and the questionnaire face-to-face. The study was conducted in Kuching, the capital city of Sarawak, a Malaysian state located on Borneo Kalimantan Island.

The enumerators explained the study to participants and asked them to sign a consent form indicating their willingness to participate in the study. They were told that no personal information would be revealed in any reports on the study. Because this was a low-risk survey study, ethical approval was not needed from the university. However, to ensure the participants' safety, enumerators were trained to answer questions about NPC, and contact details of the researchers were provided to participants. There were no participants under 16 years old in the study.

Measures

The survey comprised a questionnaire eliciting self-reports of independent measures: perceived risk (three items, Katapodi et al., 2004); response efficacy (four items, Grasso & Bell, 2015); and self-efficacy (six items, Bell et al., 2014). The dependent measures consisted of items on intended behavior to reduce NPC risk (six items, Bell et al., 2014; Rimal et al., 2009). The questionnaire also contained demographic and health status questions.

All the items used 7-point Likert-type scales with a neutral option. The questionnaire items are shown in Table 2. The instrument was developed by first conducting a pilot study in which we surveyed our contacts for appropriateness and clarity of the items and then refining the items based on responses received.

Goodness of Measures: Reliability Test. This current research takes the coefficient of Cronbach's alpha to assess the reliability of the items. Table 2 reports the alpha values (0.8241 for perceived risk, 0.6494 for response efficacy, 0.8140 for self-efficacy, and 0.8819 for intention). Those alpha values are above 0.6, implying the items for each construct is reliable (Nunnally & Bernstein, 1994).

Goodness of Measures: Construct Validity. We tested the construct validity to obtain the measure fit (Sekaran & Bougie, 2010). It can be assessed from the respective loadings and cross-loadings. We followed Hair et al.'s (2010) threshold of 0.5 to infer the validation of an item. This means that an item needs to have a value of 0.5 for its dimension only. As such, if an item has a loading value higher than 0.5 on two or more dimensions, then it can be concluded there is an issue of cross-loading. All items measuring a particular dimension loaded highly on that construct (higher than 0.5) and loaded lower on another construct (lower than 0.5), thus confirming construct validity.

Goodness of Measures: Convergent Validity. We further tested the items' convergent validity by utilizing composite reliability and average variance extracted as the assessment. This test is important to ensure the degree to which multiple items that measure the same concept are in agreement. Table 2 reports composite reliability values of 0.8802, 0.8088, 0.8630, and 0.9100 for constructing perceived risk, response efficacy, self-efficacy, and intention, respectively. Those values exceed the recommended threshold of 0.7 from Hair et al. (2010), implying the items have good convergent validity. Table 2 also reports the AVE values, wherein the values are 0.7163, 0.5852, 0.6134, and 0.6280 for constructing perceived risk, response efficacy, self-efficacy, and intention, respectively. Those values exceed the recommended threshold of 0.5 from Thompson et al. (1995). Hence, we conclude that all four constructs (perceived risk, response efficacy, self-

Table 1

Demographic Characteristics of Participants (n=215)

Demographic Variables		n	%
Gender	Male	99	46%
	Female	116	54%
Age (Years)	< 20	37	17%
	21-30	62	29%
	31-40	58	27%
	41-50	22	10%
	51-60	15	7%
	>60	21	10%
Marriage Status	Single	107	50%
	Married	99	46%
	Divorced	6	3%
	Widowed	3	1%
Ethnic Group	Malay	38	18%
	Chinese	83	39%
	Sarawakian	88	41%
	Others	6	3%
Education	Primary	5	2%
	Form 3	8	4%
	Form 5/Certificate	77	36%
	Form 6/Diploma/Matriculation	39	18%
	Bachelor Degree	64	30%
	Postgraduate Degree	18	8%
	Professional Qualification	4	2%
Income	No Income	45	21%
	<RM20,000	58	27%
	RM2,000-RM3,999	66	31%
	RM4,000-RM5,999	35	16%
	>RM6,000	11	5%
Knowledge of NPC	Some knowledge of NPC	123	57%
	Experienced NPC	28	13%
	Family experienced NPC	14	7%
	Work deals with NPC	12	6%
	Friends and colleagues experienced NPC	43	20%
	Undertaken medical tests for NPC	12	6%

Table 2

Results of Measurement Model

Model Construct		Items	Loading	CR	AVE	Cronbach Alpha
Perceived Risk	1.	Nose and throat cancer could happen to me.	0.6243	0.8802	0.7163	0.8241
	2.	How likely are you to get nose and throat cancer?	0.9334			
	3.	How likely are you to get nose and throat cancer compared with other people your age?	0.9423			
Response Efficacy	1.	How confident are you that changing to a healthier lifestyle (e.g., *diet, exercise*) can reduce the risk of nose and throat cancer?	0.7874	0.8088	0.5852	0.6494
	2.	How confident are you that avoiding certain food	0.7605			
	3.	How confident are you that avoiding environmental pollutants can reduce the risk of nose and throat cancer?	0.7464			
Self- Efficacy	1.	How confident are you that you can change to a healthier lifestyle	0.6374	0.8630	0.6134	0.8140
	2.	How easy is it for you to change to a healthier lifestyle to reduce the risk of nose and throat cancer?	0.6640			
	3.	How confident are you that you can avoid certain food said to cause nose and throat cancer to reduce the risk of the disease?	0.7920			
	4.	How easy is it for you to avoid certain food believed to cause nose and throat cancer to reduce the risk of the disease?	0.7283			
	5.	How confident are you that you can go for medical tests for nose and throat cancer for early detection/treatment of nose and throat cancer?	0.7502			
	6.	How easy is it for you to go for medical tests for nose and throat cancer for early detection/ treatment of nose and throat cancer?	0.7163			
Intention	1.	I intend to lead a healthier lifestyle after today.	0.8279	0.9100	0.6280	0.8819
	2.	I intend to lead a healthier lifestyle after today to reduce the risk of getting a nose and throat cancer.	0.8358			
	3.	I intend to avoid environmental pollutants after today.	0.8008			
	4.	I intend to avoid environmental pollutants after today to reduce the risk of getting a nose and throat cancer.	0.8018			
	5.	I intend to do medical tests to monitor my health after today.	0.7571			
	6.	I intend to do medical tests after today for early detection/treatment of nose and throat cancer.	0.7259			

efficacy, and intention) are all valid measures of their respective dimensions based on the convergent validity test. All constructs (perceived risk, response efficacy, self-efficacy, and intention) have valid measures based on their parameter estimates and statistical significance (Chow & Chan, 2008).

Goodness of Measures: Discriminant Validity. Lastly, we test the discriminant validity of the measures to assess the degree to which items differentiate among constructs. This examination is important to ensure there are no potentially overlapping constructs. Table 3 shows that the squared correlation for each construct is less than the AVE values, implying adequate discriminant validity.

To test the hypotheses, we used hierarchical regression of the mediation effect under the structural equation model (SEM) approach. The dependent variable is the intention to adopt NPC risk-reducing behaviors, whereas the main independent variables are perceived risk, response efficacy, and self-efficacy. We added a mediator in our model due to the argument that the prediction of intention is intervened by response efficacy and self-efficacy.

Results

Based on Rimal and Real's (2003) RPA framework, the participants were categorized into one of the four attitudinal groups using their means scores in perceived risk, response efficacy, and self-efficacy beliefs. Over half of the participants had a proactive attitude (118 low risk, high response efficacy; 114 low risk, high self-efficacy); "they are not motivated by their perceived risk status, but rather by their desire to remain disease

Table 3

Discriminant Validity of Constructs

	Intention	Perceived Risk	Response Efficacy	Self-Efficacy
Intention	0.6280			
Perceived Risk	0.0325	0.7163		
Response Efficacy	0.1672	0.0384	0.5852	
Self-Efficacy	0.2307	0.0388	0.2756	0.6134

Table 4

Level of Intention of Participants for Each RPA Attitudes Group

	Low		Medium		High		Total
Scenario	**n**	**%**	**n**	**%**	**N**	**%**	
Response Efficacy							
Indifferent (Low Risk/Low Response Efficacy)	0	0%	0	0%	0	0%	0
Proactive (Low Risk/High Response Efficacy)	1	1%	78	66%	39	33%	118
Avoidant (High Risk/Low Response Efficacy)	0	0%	0	0%	0	0%	0
Responsive (High Risk/High Response Efficacy)	1	1%	76	79%	19	20%	96
Self-Efficacy							
Indifferent (Low Risk/Low Self-Efficacy)	1	25%	3	75%	0	0%	4
Proactive (Low Risk/High Self-Efficacy)	0	0%	75	66%	39	34%	114
Avoidant (High Risk/Low Self-Efficacy)	1	20%	3	60%	1	20%	5
*Responsive (High Risk/High Self-Efficacy)	0	0%	74	80%	18	20%	92

free" (Rimal & Real, 2003, p.372). Table 4 shows that about 44% of the participants had a responsive attitude (96 high risk and high response efficacy; 92 high risk and high self-efficacy), characterized as "being aware of their risk status and believing they have the requisite skills to avert the threat of the disease" and "motivated in enacting self-protective behaviour" (Rimal & Real, 2003, p. 372). Very few participants had avoidant (high risk, low self-efficacy) and indifferent (low risk, low self-efficacy) attitudes towards averting the NPC threat.

Path analysis was employed to analyze the seven hypotheses. Figure 1 presents the results. In terms of goodness of fit, our R2 value is 0.265, suggesting that 26.5% of the variance in the extent of self-efficacy can be explained by the hierarchical mediation of perceived risk and response-efficacy. Hence, we can conclude that our model has good explanatory power.

We divided the results into three stages, namely, (a) direct effect between independent variables and mediator including the dependent variable; (b) direct effect between the mediator and dependent variable; and (c) indirect effect between the independent variable and dependent variable.

Hypothesis 1 stated that perceived risk has an effect on response efficacy. Our results show the negative effect of perceived risk on response efficacy with the coefficient value of -0.1960. The effect is significant at 1% level ($p<0.01$), supporting the H1. Hence, higher perceived risk leads to lower response efficacy. In the RPA framework, this behavior is categorized as avoidance. The same conclusion is found for the relationship between perceived risk and self-efficacy.

Hypothesis 2 stated that perceived risk has an effect on self-efficacy. We found that perceived risk has a negative effect on self-efficacy at the significance level of 1%, with the coefficient value of -0.1968 supporting the H2. This implies that higher perceived risk leads to a lower value of self-efficacy, which is categorized as avoidance attitudes in the RPA framework. Thus, heightened risk perceptions may weaken efficacy beliefs. Perceived vulnerability to NPC seems to weaken confidence in taking precautionary measures and confidence in the measures.

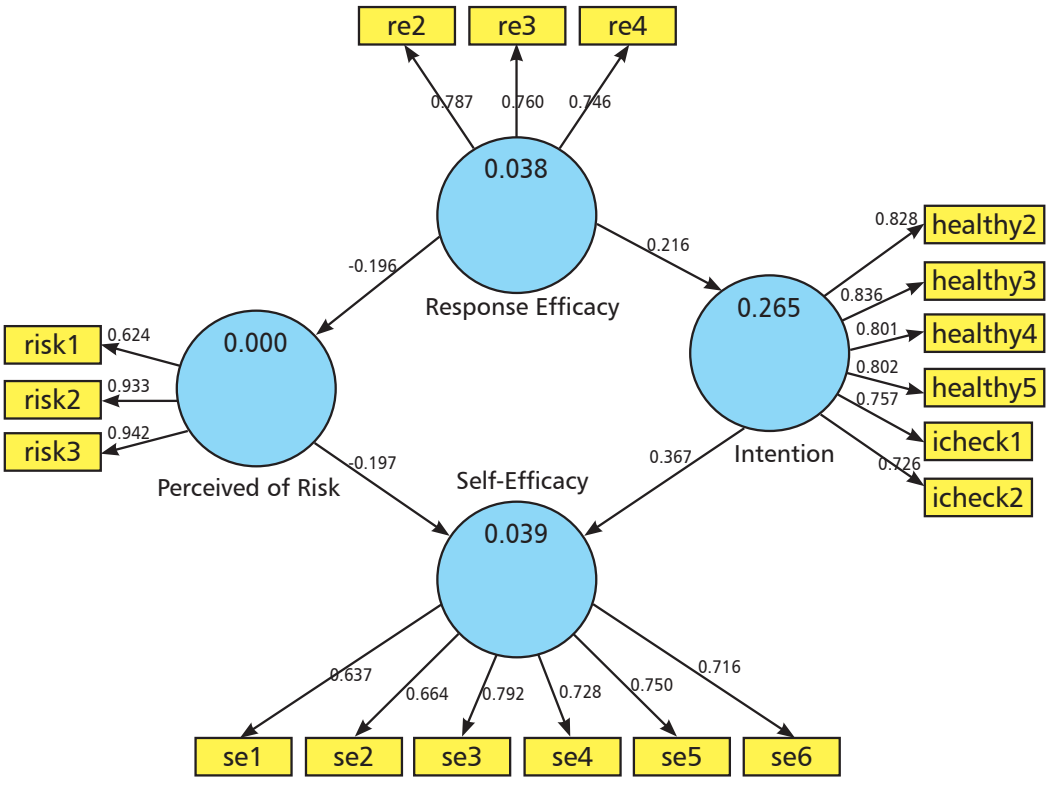

Figure 1. Structured Model of the RPA Framework Predicting Intention to Adopt NPC Risk Reducing Behaviors Among Malaysians

Figure 1 depicts the direct effect between the independent variables and dependent variable. Hypothesis 3 stated that perceived risk has an effect on intention. Perceived risk has a significant effect on intention at a 1% significance level, supporting H3. The coefficient value is -0.1146, implying that higher perceived risk worsens the intention. It supports our H3. Heightened perceived risk may result in lower motivations to enact self-protective behavior to avert the threat of NPC, reflecting a fatalistic view of their vulnerability to cancer (Rimal, 2000).

Hypothesis 4 stated that response efficacy has an effect on intention, and Hypothesis 5 stated that self-efficacy has an effect on intention. In terms of the efficacy effects on intention, Figure 1 shows that both efficacy measures have significant effects on intention at a 1% significance level. First, response efficacy has a significant effect on intention with a coefficient value of 0.214, implying higher response efficacy strengthens the intention. Self-efficacy is also found to have a significant effect on intention with the coefficient value of 0.3667, implying that a high level of self-efficacy strengthens intention to enacting NPC risk-reducing behaviors. These findings provide support for H4 and H5. Participants who believe they can take effective measures to avert the threat of NPC may be motivated to engage in more extensive precautionary behavior.

We ran the indirect effect for testing the path analysis of response efficacy. The findings show a significant effect of response efficacy as the mediator in linking perceived risk and self-efficacy. Therefore, confidence in the effectiveness of precautionary behavior induces self-confidence to adopt NPC risk-reducing behaviors.

We also tested the indirect effect from the perceived risk effect. Hypothesis 6 stated that response efficacy mediates the relationship between perceived risk and intention, whereas Hypothesis 7 stated that self-efficacy mediates the relationship between perceived risk and intention. Our estimations have different conclusions for each efficacy measure. When we take response efficacy as the mediator, the result depicts that there is no mediation effect of response efficacy for the relationship between perceived risk and intention. Meanwhile, when self-efficacy is used as the mediator, there is a significant mediation effect to the extent that perceived risk influences intention. However, the relationship is arguably significant due to its 10% significance level. The mediation effect is negative, implying that self-efficacy significantly carries the influence of perceived risk to reduce the intention of participants to enact NPC risk-reducing behaviors. It seems that while efficacy behaviors play a limited role in mediating the effect of perceived risk upon intention, self-efficacy or confidence in adopting precautionary measures have some mediation effect.

Discussion

The current study examined the viability of RPA in predicting intention to enact NPC risk-reducing behaviors in a sample of Malaysians. To our knowledge, this is the first study to use the RPA framework to understand factors influencing individuals' motivation to enact preventive or self-protective measures to reduce NPC risk in a setting of high NPC incidence. There were no similar surveys in Malaysia or neighboring Asian countries with a high incidence of NPC, such as Indonesia and Hong Kong, as the studies are also on the epidemiology of NPC (Adham et al., 2012; Cheung et al., 1996; Rahman et al., 2013, Tse et al., 2006; Yu et al., 1986). Hence, the significance of our study is that it has obtained information that is hitherto not available on perceptions of the severity of NPC, susceptibility to NPC, and efficacy beliefs pertaining to reducing the risk of NPC. Despite National Cancer Registry records showing NPC ranking number five in cancer incidences (Ministry of Health, Malaysia, 2015), the participants in our study perceived themselves to be at low risk to NPC and rated the severity of NPC as marginally low. However, their efficacy beliefs and intentions to enact self-protective behaviors were moderately high. Their perceptions of the low threat of NPC could be due to a lack of awareness of NPC incidences. The latest National Cancer Registry showed that age-standardized rates for nose and throat cancer incidences among men and women in Malaysia are 6.4 and 2.2, respectively, in the 2007-2011 period (Ministry of Health, Malaysia, 2015). The results on the lack of awareness of NPC are consistent with findings on the insufficient knowledge on breast cancer (Hadi et al., 2010; Norlaili et al., 2013), colorectal cancer (Su et al., 2010), oral cancer (Ghani et al., 2013), and cervical cancer (Khoo et al., 2011; Wong et al., 2009) in Malaysia. In fact, Samat et al.'s (2014) survey showed that only 68% of the participants have some knowledge of cancer risk factors, and the study involved urban

and educated Malaysians. In our study, 57% of the participants reported having some knowledge of NPC (Table 1). It is expected that the level of awareness on NPC would be even lower among the rural population, indicating the need for education.

Our study yielded somewhat unexpected results on the negative relationship between perceived risk with intention, response efficacy, and self-efficacy. In the RPA framework, Rimal and Real (2003) predicted that high risk would increase motivation to enact self-protective health behaviors but, in our study, it had the opposite effect. Two possible reasons are discussed here. First, there could be a strong sense of fatalism because the participants believed that there was not much they could do to avert NPC because cancer is unlike infectious diseases whereby people can take measures to minimize their risk. Ting et al. (2018) found taboos surrounding cancer. The participants avoided the topic of NPC and were apprehensive when talking about it for fear of inviting cancer into their lives (O'Callaghan et al., 2016). They were mostly resigned to the fact that chance determined whether they got cancer. Elsewhere, taboos have been found to hinder women from taking up breast cancer screening (Banning et al., 2010). Second, the participants could be unaware of their risk. As a group, the participants had a low level of perceived risk. Few had a family history of cancer (only 14 out of 215, Table 1), believed they led a generally healthy lifestyle, and were not exposed to potential risk factors, such as preserved food and environmental pollutants.

Furthermore, these risk factors of NPC are not established because of mixed results in past studies. Our study indicated that a high level of perceived risk weakens efficacy beliefs and intention to enact self-protective measures. However, in information campaigns, it is still necessary to impart information on the risk so that the public is informed of the correct facts on NPC risk and severity, but the framing should take into account their psychological profile, determined using the RPA framework. In addition to health risk, the framing of the NPC risk messages can take into account financial risk because cancer treatment and management are costly (Zafar et al., 2013), and the awareness may motivate the public to consider screening and lifestyle changes (e.g., preserved food, exposure to environmental pollutants) although the latter may not be confirmed risk factors of NPC.

Conclusion

The study provides important information on how risk and efficacy perceptions of a sample of the Malaysian population with respect to intention to enact self-protective behaviors. The most striking finding from our study is the stronger mediating influence of self-efficacy on perceived risk and intention compared to response efficacy. In fact, response efficacy does not mediate between perceived risk and intention. Previous studies examined the relationship between perceived cancer risk and self-efficacy for intention to engage in cancer prevention diets (Sullivan et al., 2008), information seeking, and cancer screening (Rimal & Juon, 2010; Wong, 2009, 2012). However, these studies treated efficacy beliefs as one construct. By treating response efficacy and self-efficacy as distinct constructs, our study has indicated that it is the self-confidence to enact self-protective health behaviors, which motivated participants to act on the perceived risk of NPC. Surprisingly, response efficacy did not influence participants to alleviate their risk of NPC. In our study, the self-protective measures examined were screening, reducing preserved food (e.g., preserved vegetables, salted eggs), reducing exposure to environmental pollutants, and adopting a healthy lifestyle (e.g., exercise). The selection of these measures was based on research, which has shown the association of NPC with preserved food (Armstrong et al., 1998) and environmental pollutants (Armstrong et al., 1978, 2000). In our study, the participants had confidence that these self-protective measures were somewhat effective, but this was not a factor in heightening their intention to adopt these measures. Instead, their intention to enact these measures was influenced by their self-efficacy or confidence to exert personal control over their health behaviors. The participants had high response and self-efficacy, with almost equal numbers having proactive and responsive attitudes. They had different motivations to enact self-protective behavior; the proactive group seeks to remain disease-free, whereas the response group seeks to avert the disease threat (Rimal & Real, 2003). Hence, considering the mediating effect of self-efficacy between perceived risk and intention, education to increase awareness of NPC needs to focus on elevating the confidence of the target audience to take self-protective measures, and

perhaps convincing them of the ease of performing those measures.

However, because it is the first of such studies to examine factors influencing individuals' motivation to enact self-protective measures to reduce NPC risk using the RPA, further studies should be conducted to test the model with other samples within the Malaysian population to find out whether it can explain intention to enact NPC risk-reducing behaviors. Although the current model has identified self-efficacy as an important construct to target in NPC risk message design, one limitation of the study is that the findings were based on self-reports of the perceived risk of NPC, which is variable and subject to an individual's prior beliefs. This was also clouded by the participants' taboos in assessing their own risk for fear that it would invite cancer incidences. In view of this, an important angle of investigation to undertake in the future is message effects on perceptions of risk and efficacy to obtain evidence-based information on individual's conceptualization of perceived threat of NPC as a property of the message. The findings will inform the design of group-specific risk messages, taking into consideration the audience segmentation afforded by the survey findings on the influence of risk and efficacy beliefs on motivation to enact self-protective health behaviors.

Acknowledgment

This work was funded by the Ministry of Education, Malaysia via the Transdisciplinary Research Grant Scheme (TRGS) [Grant no. C09/TRGS/1519/2016].

Declaration of ownership

This report is our original work.

Conflict of interests

None.

Ethical clearance:

This study was approved by our institution.

Availability of data and materials

The data used to support the findings of this study are available from the corresponding author upon request.

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