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**Cultural Effects on Cancer Prevention Behaviors: Fatalistic Cancer Beliefs and Risk
Optimism Among Asians in Singapore**

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Abstract

Although culture is acknowledged as an important factor that influences health, little is known about cultural differences pertaining to cancer-related beliefs and prevention behaviors. This study examines two culturally influenced beliefs – fatalistic beliefs about cancer prevention and optimistic beliefs about cancer risk– to identify reasons for cultural disparity in the engagement of cancer prevention behaviors. We utilized data from national surveys of European Americans in the United States (Health Information National Trends Survey 4, Cycle3; $N = 1,139$) and Asians in Singapore ($N = 1,200$) to make cultural comparisons. The odds of an Asian adhering to prevention recommendations were less than half the odds of a European American, with the exception of smoking avoidance. Compared to European Americans, Asians were more optimistic about their cancer risk both in an absolute and a comparative sense, and held stronger fatalistic beliefs about cancer prevention. Mediation analyses revealed that fatalistic beliefs and absolute risk optimism among Asians partially explain their lower engagement in prevention behaviors, whereas comparative risk optimism increases their likelihood of adhering to prevention behaviors. Our findings underscore the need for developing culturally targeted interventions in communicating cancer causes and prevention.

Keywords: cultural disparity, cancer prevention, Asian culture, fatalism, risk optimism

Cultural Effects on Cancer Prevention Behaviors: Fatalistic Cancer Beliefs and Risk Optimism Among Asians in Singapore

Culture has been recognized as an important factor that influences health beliefs and health-related behaviors (Spector, 2000; Gifford, 1991). Prior research has demonstrated that ethnic minorities in western countries are less likely to engage in cancer screening and prevention behaviors (Hiatt et al., 2001; Dollis, Gifford, Henenberg, & Pirkis, 1993). In particular, those whose cultural base is from Asia (e.g., Asian Americans) have the lowest cancer screen rate of all ethnic groups, even though the number of new cancer cases is expected to increase by 132% in this ethnic group (Kagawa-Singer, Dadia, Yu, & Surbone, 2010; Babey et al., 2003). While some researchers argue that these disparities are largely attributable to differences in socioeconomic status (Freeman, 1989), there may be salient barriers to the adherence of cancer prevention behaviors that are deep-rooted and reinforced by cultural beliefs. However, little is known about cultural differences in beliefs about cancer risk and prevention.

Cultural Differences in Beliefs about Cancer Risk and Prevention

Culture is defined as “the fundamental... and relatively coherent organizing system of life designed to ensure the survival and well-being of its members”, which comprises beliefs, values, and lifestyles (Kagawa-Singer et al., 2010, p. 17). Culture is considered as a social construct and thus distinguished from psychological traits that belong to the individual sphere (Church, 2000). Individuals make sense of their life events, including cancer related experiences, through their own cultural worldview. For instance, family or the patient’s culture can change the meanings assigned to the risk of cancer and response to the disease as well as its treatment process (Kagawa-Singer et al., 2010). Some evidence suggests that cultural differences between East-West change individuals’ cognitive processes (Nisbett, Peng, Choi, & Norenzayan, 2001), which may lead to divergent judgment and decision-

making (Weber & Morris, 2010). There are potentially two culturally influenced beliefs associated with cancer prevention: fatalistic beliefs about cancer prevention and optimistic beliefs about cancer risk.

Fatalistic beliefs about cancer prevention. Fatalism refers to an outlook that external forces control future events and thus individuals are powerless to change them. Although cancer fatalism has often been operationalized as the belief that “death is inevitable when cancer is present” focusing on the survivorship (Powe & Finnie, 2003, p. 454), fatalism also applies to other stages of the cancer continuum including cancer prevention and screening (Niederdeppe & Levy, 2007). Studies have shown that fatalistic beliefs about cancer prevention are characterized by pessimism, helplessness, and confusion about preventive measures (Underwood, 1992; Straughan & Seow, 1998; Niederdeppe & Levy, 2007).

Based on a national survey, nearly half of Americans believed that “everything causes cancer” and 27% agreed that “there’s not much a person can do to prevent cancer” (Niederdeppe & Levy, 2007), suggesting cancer fatalism prevalence among Americans. Fatalism has been suggested as a major barrier to cancer prevention behaviors (Straughan & Seow, 1998; Niederdeppe & Levy, 2007), because it reduces the perceived value as well as the motivation and self-efficacy to perform recommended behaviors (Underwood, 1992; Straughan & Seow, 1998). Despite its critical role in cancer prevention, there has been little attention paid to the causes of fatalistic thinking other than educational status.

Some extant research point to ethnic or cultural differences in fatalism about cancer prevention (Straughan & Seow, 1998; Lannin et al., 1998; Chavez, Hubbell, Mishra, & Valdez, 1997); however, these studies are mostly based on small, unbalanced samples limiting its capability to make comparisons between ethnic groups. Furthermore, there is a lack of research that investigates Asian’s cancer fatalism that may be reinforced by cultural beliefs.

Based on traditional life philosophy, people from Eastern cultures (i.e., Asians) tend to hold a more fatalistic worldview considering negative life events, such as having cancer, as unpredictable and beyond one's own control (Kwok & Sullivan, 2006). A shared belief in fate is embedded in religious tradition of Taoism and interpreted as a force beyond human control that determines people's destinies (Eberhard, 1966). This cultural belief persists in modern Asian societies such as China, Hong Kong, and Singapore (Chan, 2000) and even in Asian communities in the U.S. (Phillips et al., 2001). Thus, Asians are more likely than others to attribute negative life events to fate and to allow events to take their natural course without active interference (Bond, 1991; Kirkland, 2004). The diagnosis of cancer is often attributed to bad luck, punishment for sins committed in the current or previous life, or the will of a supreme being (Ong, Back, Jiade, Shakespere, & Wynne, 2002), making it less likely for Asians to take proactive measures to prevent cancer. In a study of Asian women in Singapore, for instance, half of the respondents considered the cervical cancer could not be prevented (Seow, Wong, Smith, & Lee, 1995), which sharply contrasts a 20% obtained from a sample of American women (Bostick, Sprafka, Virnig, & Potter, 1993).

Optimistic beliefs about cancer risk. Dispositional optimism refers to generalized positive outcome expectancies (Scheier & Carver, 1985) or a positive outlook on life (Dember, Martin, Hummer, Howe, & Melton, 1989). Optimistic beliefs about health risk, which is distinct from dispositional optimism, refer to biased risk perception negating one's own vulnerability to develop health diseases or problems (Weinstein, 1987; Radcliffe & Klein, 2002). People can be optimistic about their health risk in two different ways: (1) *comparatively* by believing their own risk to be lower than what they believe to be the average (or similar others') risk and (2) *absolutely* by considering their own risk without being compared to others. Comparative risk optimism is psychologically important given that people often find it difficult to understand their objective risk (Radcliffe & Klein, 2002). For

instance, in a study, comparative risk perception was a stronger predictor of colorectal cancer screening behaviors than absolute risk judgment (Blalock, DeVellis, Afifi, & Sandler, 1990).

People often believe that they are not vulnerable or less likely than similar others to experience negative health issues (Perloff & Fetzner, 1986; Weinstein, 1980). Health promotion theories, such as the Health Belief Model and Protection Motivation Theory, predict that people are more likely to take preventive actions when they perceive their risk of negative health outcome to be high. Prior research has found that risk underestimation reduces attention to risk information and the performance of precautionary behaviors (Radcliffe & Klein, 2002; O'Brien, VanEgeren, & Mumby, 1995).

Although optimism about personal health risks is a well-documented phenomenon in studies across different populations, research has revealed inconsistent results on cultural comparisons (Chang, Asakawa, & Sanna, 2001; Davis, Pyrel, & Green, 2013; Ji, Zhang, Usborne, & Guan, 2004). Compared to Western populations, people from Eastern cultures are suggested to be less self-enhancing, and even self-critical, as they are motivated to maintain harmony by seeing oneself as similar to others (Heine & Hamamura, 2007). Due to this cultural tendency, some research found that North Americans were more likely to hold comparative optimism than Asians (i.e., Japanese) when considering their chances of experiencing negative events (Chang et al., 2001; Heine & Lehman, 1995). Yet, a different body of research has found counter-evidence to these cultural motivations. In a study, for instance, North Americans considered that they would cope worse than others if they actually experienced negative health events (Blanton, Axsom, McClive, & Price, 2001).

People from Eastern cultures tend to reason holistically, believing in the relatedness of objects and events and consider that things are constantly changing in a cyclical fashion (i.e., naïve dialecticism). This belief system allows Asians to stay hopeful even when things are moving in the negative direction, like developing cancer (Ji et al., 2004). On the contrary,

Westerners' cognitive orientation tends to be analytical, with attention focused on the central objects while disregarding the context. For Westerners, things are generally constant and changes, if they were to occur, happen rather in a linear way. This belief system makes European Americans believe that life matters will continue as they are, making them less optimistic when faced with a negative situation (Ji et al., 2004). Consistent with this explanation, some research suggests that Asians (vs. European Americans) are more likely to believe that they have a lower chance of getting cancer or flu (e.g., Davis et al., 2013; Ji et al., 2004).

Study Objectives

This research examines fatalistic beliefs about cancer prevention and optimistic beliefs about cancer risk, both of which may be closely related to cultural disparities in adhering to cancer prevention behaviors. Building upon the theoretical rationale described earlier (Kwok & Sullivan, 2006; Ong et al., 2002; Ji et al., 2004), Asians are expected to hold more (a) fatalistic beliefs about cancer prevention and (b) optimistic beliefs about cancer risk than European Americans (H1). In light of prior research on ethnic disparities in cancer screening behaviors (Hiatt et al., 2001; Dollis et al., 1993), cancer prevention behaviors are expected to be less prevalent among Asians compared to European Americans (H2). As both fatalistic beliefs (Straughan & Seow, 1998; Niederdeppe & Levy, 2007) and risk optimism (Radcliffe & Klein, 2002; O'Brien et al., 1995) have been suggested as major barriers to cancer prevention behaviors, we further hypothesize that (a) fatalistic beliefs about cancer prevention and (b) optimistic beliefs about cancer risk mediate the relationship between cultural background (Asian versus European-American) and engagement in cancer prevention behaviors (H3).

Methods

This cross-cultural study used data collected from two countries, the United States (US) and Singapore. For the US, we used data from the Health Information National Trends Survey (HINTS4, Cycle3), conducted by the US National Cancer Institute. HINTS used a random stratified sampling to recruit American participants in a mail survey between September and December, 2013 (National Cancer Institute, 2014). Interviews were completed with 3,185 subjects (response rate = 35%). For the purpose of this study, we focused on the European American (i.e., Non-Hispanic White) sub-sample aged 18 to 65 ($N = 1,139$) to make parallel comparisons with the Asian sample collected separately between June and July, 2014. Only 3.6% of the HINTS respondents were Asian (versus 50% Non-Hispanic White). Due to this imbalance, we collected Asian data using the same questionnaire items as HINTS to test our hypotheses.

In light of the criticism that ethnic disparities in health are largely attributable to differences in socioeconomic status (Freeman, 1989), we chose Singapore sample to match the socioeconomic characteristics of the US sample. Singapore is an urban, developed country with high GDP per capita (\$56,287 USD), comparable to that of the US (\$54,630USD; The World Bank, 2014). Singapore is a multi-ethnic country predominantly ethnic Chinese (74%), with 13% Malays, and 9% Indians (Department of Statistics in Singapore, 2014) where the population predominantly speak English. Singapore sample was drawn from the Qualtrics online panel in proportion to demographic quotas (age, gender, citizenship, ethnicity, and monthly income). In total, 3,630 invitations were sent out and resulted in a final response rate of 33% ($N = 1,200$). We utilized both the US and Singapore samples to address our hypotheses, resulting in a total sample of $N = 2,339$.

Measures

Fatalistic beliefs about cancer prevention. On a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree), respondents reported their level of agreement with three

statements measuring fatalistic beliefs about cancer prevention (HINTS used a 4-point scale; we thus transformed data to a common scale): (a) “It seems like everything causes cancer” ($M = 3.43$, $SD = 1.13$), (b) “there's not much people can do to lower their chances of getting cancer” ($M = 2.53$, $SD = 1.14$), and (c) “there are so many recommendations about preventing cancer, it's hard to know which ones to follow” ($M = 3.58$, $SD = .99$). These belief items had low scale reliability (Cronbach's $\alpha = .61$), consistent with prior research (Niederdeppe & Levy, 2007), as they address different components of fatalism. We thus analyzed these beliefs separately treating them as distinct constructs. These items have demonstrated construct validity across multiple studies (e.g., Niederdeppe & Levy, 2007; Jensen et al., 2014).

Optimistic beliefs about cancer risk. We assessed respondent's perceived risk of getting cancer both in an absolute and a comparative sense (lower score the more optimistic): (a) absolute risk perception: “How likely are you to get cancer in your lifetime?” (1 = very unlikely; 5 = very likely; $M = 3.04$, $SD = .92$) and (b) comparative risk perception: “Compared to other people your age, how likely are you to get cancer in your lifetime?” (1 = much less likely; 2 = less likely; 3 = about the same; 4 = more likely; 5 = much more likely; $M = 2.74$, $SD = .84$).

Cancer prevention behaviors. We addressed four cancer prevention behaviors recommended by health professionals and organizations: (a) regular exercise, (b) smoking avoidance, (c) fruit and vegetable intake, and (d) sunscreen use. Each preventive behavior was recoded into adherence or not to the guideline distributed by the relevant health authorities (e.g., the Surgeon General, Singapore/American Cancer Society). Respondents reported the number of days in a typical week they do any physical activity or exercise of at least moderate intensity (1 = 1 day per week; 7 = 7 days per week; $M = 2.79$, $SD = 1.84$). “Regular exercise” was defined as exercising at least three times in a typical week (Report of the Surgeon General, 1979a).

Smoking behavior was measured with “How often do you now smoke cigarettes?” (1 = not at all; 2 = some days; 3 = everyday; $M = 1.29$, $SD = .67$). “Avoid smoking” was defined as those who currently do not smoke at all (Report of the Surgeon General, 1979b).

Sunscreen use was assessed with, “When you are outside for more than one hour on a warm, sunny day, how often do you wear sunscreen?” (1 = never; 5 = always; $M = 2.64$, $SD = 1.35$). Those who reported that they always or most of the times wear sunscreen when they go out were categorized as practicing a recommended cancer prevention behavior (American Cancer Society, 2003).

Fruit and vegetable consumption was assessed with two items: “About how many cups of fruit [vegetable] (including 100% pure fruit [vegetable] juice) do you eat or drink each day?” (0 = none; 1 = $\frac{1}{2}$ cup or less; 2 = $\frac{1}{2}$ cup to 1 cup; 3 = 1 to 2 cups; 4 = 2 to 3 cups; 5 = 3 to 4 cups; 6 = 4 or more cups; $M_{fruit} = 2.26$, $SD = 1.35$; $M_{veggie} = 2.47$, $SD = 1.36$). Responses to these two items are summed to create an index of average number of fruit and vegetable intake per day ($M = 2.52$, $SD = 1.75$). Those who consume five or more servings of fruits and vegetables per day are categorized as adhering to the US national guideline (Report of the Surgeon General, 1979a; US Department of Health and Human Services, 2000).

Analytic Approach

We began the analysis by comparing the respondent characteristics between two samples. To address cultural differences in beliefs about cancer risk and prevention (H1), we ran two separate multivariate analyses of covariance (MANCOVA), controlling for demographic factors such as age, gender, income, and education. To predict the likelihood of a participant engaging in cancer prevention behaviors as a function of cultural difference (H2), we ran a series of logistic regressions for each recommended behavior, controlling for demographic factors. We also performed parallel analyses with the interval dependent measures using multiple regressions, and found consistent patterns with the results from

logistic regressions. For the sake of simplicity, we only report results from logistic regressions focusing on dichotomized outcome.

To address H3, we conducted multiple mediation analyses with the PROCESS macro (SPSS) to examine psychosocial mechanisms for observed cultural disparities in the engagement of cancer prevention behaviors. Multiple mediation models determine whether an overall effect exists if multiple belief factors are entered into the model (i.e., total indirect effect) and to what extent specific belief factor mediates, conditional on the presence of other mediators. As we employed a quota sampling, the Asian sample reflected national demographic characteristics of Singapore in terms of age, gender, ethnicity, and income. We did not account for oversampling by race/ethnicity employed by HINTS, because only the European American sub-sample was included in the study.

Results

Sample Characteristics

The Asian sample consisted of 50.8% females with an average age of 37.8 years ($SD = 12.17$). As for the European American sample, more than half was female (60%) with an average age of 47.7 years ($SD = 12.29$). Both samples were similar in terms of education and income, as half of the respondents graduated college or higher education, and earned more than \$50,000 (USD). To account for demographic differences between two samples, we controlled for age, gender, education, and income in the subsequent analyses. Table 1 presents demographic characteristics of the two samples.

Cultural Differences in Cancer Beliefs (H1) and Prevention Behaviors (H2)

Using MANCOVA, fatalistic beliefs about cancer prevention significantly differed by cultural background on the multivariate level, $F(3, 2156) = 46.87, p < .001, \eta_p^2 = .06$. On the univariate levels, compared to European Americans, East Asians were more likely to believe that “everything causes cancer” ($M_{Asian} = 3.53, M_{American} = 3.38, F = 7.98, p = .005, \eta_p^2 = .01$),

“there’s not much one can do to lower risk” ($M_{Asian} = 2.91$, $M_{American} = 2.31$, $F = 139.96$, $p < .001$, $\eta_p^2 = .06$), and “there’s too many recommendations” ($M_{Asian} = 3.69$, $M_{American} = 3.51$, $F = 13.78$, $p < .001$, $\eta_p^2 = .01$). In a separate MANCOVA, beliefs about cancer risk also significantly differed by cultural background on the multivariate level, $F(2, 2030) = 27.22$, $p < .001$, $\eta_p^2 = .03$. Compared to European Americans, Asians were less likely to believe that they will get cancer in their lifetime both in an absolute sense ($M_{Asian} = 2.91$, $M_{American} = 3.23$, $F = 54.45$, $p < .001$, $\eta_p^2 = .03$) and in comparison to other people at their age ($M_{Asian} = 2.67$, $M_{American} = 2.85$, $F = 19.81$, $p < .001$, $\eta_p^2 = .01$). Thus, H1 was supported (Table 2).

As presented in Table 3, cultural background was a significant factor predicting the likelihood of adhering to four cancer prevention behaviors. The odds of an Asian adhering to three cancer prevention recommendations were less than half the odds of a European American respondent: (1) exercise regularly ($OR = .36$, $p < .001$), (2) taking 5 servings of fruits and vegetables per day ($OR = .39$, $p < .001$), and (3) applying sunscreen ($OR = .46$, $p < .001$). On the contrary, the odds of an Asian avoiding smoking were 1.44 times greater than the odds for a European American ($p < .001$). Thus, H2 was partially supported.

Test of Mediation (H3)

Having confirmed that the likelihood of cancer prevention behaviors differs by cultural background, we performed mediation analyses to identify belief factors that explain cultural disparity. Using methods developed by Preacher and Hayes (2008), path coefficients and bootstrap bias corrected confidence intervals (CI; 5,000 samples) were estimated in multiple mediator models. We first examined the associations between belief factors and prevention behaviors (Table 3). In each mediation model, belief factors that were associated with each cancer prevention behavior ($p < .10$) were entered as potential mediators. Demographic factors associated with each prevention behavior were also entered as covariates. Table 4 presents these results.

Regular exercise. Fatalistic beliefs were significant predictors of a respondent's reduced likelihood of regular exercise: "everything causes cancer" ($OR = .91, p < .05$), "not much one can do to lower risk", $OR = .90, p < .05$), and "too many recommendations" ($OR = .85, p < .01$). For each unit increase in comparative risk perception (i.e., decrease in optimism), contrary to our expectation, the odds of regular exercise reduced by a factor of .81 ($p < .01$; no association with absolute risk perception). Thus, three fatalistic beliefs and comparative risk perception were examined as potential mediators, controlling for gender and age. The total indirect effect was significant (95% $CI = [-.14, -.01]$) and all four beliefs emerged as significant mediators between the effect of cultural background and the likelihood of regular exercise: (1) "everything causes cancer" (95% $CI = [-.04, -.002]$), (2) "not much one can do to lower risk" (95% $CI = [-.12, -.01]$), (3) "too many recommendations" (95% $CI = [-.06, -.01]$), and (4) comparative risk perception (95% $CI = [.02, .07]$).

Avoid smoking. The odds of smoking avoidance significantly (1) reduced with an increase in the belief that "everything causes cancer" ($OR = .86, p < .05$; no association with two other fatalistic beliefs) and comparative risk perception ($OR = .51, p < .001$) and (2) increased with absolute risk perception ($OR = 1.23, p < .001$). Controlling for gender, income, and education, the bias-corrected 95% CI for the indirect effect of "everything causes cancer" (95% $CI = [-.10, -.02]$), comparative risk (95% $CI = [.07, .18]$), and absolute risk (95% $CI = [-.12, -.01]$) did not contain zero, indicating significant mediations. However, the total indirect effect through these three belief factors was not significant on avoiding smoking (95% $CI = [-.07, .09]$).

Fruit and vegetable intake. Only the belief that "there are too many recommendations" was marginally associated with the odds of eating fruits and vegetables ($OR = .88, p < .10$). Controlling for education, the belief that "there are too many recommendations" emerged as a significant mediator between the effect of cultural

background and the likelihood of adhering to the fruit and vegetable intake guideline (95% *CI* = [-.07, -.01]).

Sunscreen use. Both comparative and absolute risk perceptions were found to be marginally associated with the odds of using sunscreen: comparative risk ($OR = .86, p < .10$) and absolute risk ($OR = 1.15, p < .10$). Controlling for gender, income, and education, comparative risk perception was a significant mediator (95% *CI* = [.002, .06]), but not the absolute risk perception (95% *CI* = [-.09, .007]). The total indirect effect was not significant (95% *CI* = [-.05, .03]).

Discussion

This cross-cultural study demonstrates more prevalent fatalistic beliefs about cancer prevention and optimistic beliefs about cancer risk among Asians compared to European Americans. Our findings suggest that these culturally influenced beliefs, partly, explain cultural disparity in adhering to cancer prevention recommendations. We used a large, balanced number of participants to make cultural comparisons, advancing prior research, which predominantly had examined within an immigrant context. This study offers useful guidance for communicating cancer causes and prevention to different cultural groups.

Consistent with prior research on cancer screening (Hiatt et al., 2001; Dollis et al., 1993), Asians were less likely to engage in cancer prevention behaviors, except for avoiding smoking. In particular, the largest differences were observed in the domains of regular exercise and taking five servings of fruits and vegetables per day, both of which are recommended as effective measures to prevent colon cancer (Report of the Surgeon General, 1979a). Colon cancer is one of the most common cancer types in Asia (Sung, Lau, Goh & Leung, 2005). Although Asians have a comparatively lower incidence of colon cancer than Western populations, the incidence and mortality are rising rapidly in Asia (Pourhoseingholi, 2012). Our findings, combined with the epidemiological evidence, highlight the need for

effective intervention programs to promote regular exercise and fruit and vegetable intake targeted to Asians.

To offer useful guidance for designing culturally targeted interventions, we examined two culturally influenced beliefs about cancer causes and prevention and their influence on the performance of prevention behaviors. Asian's traditional life philosophy suggests that negative life events are unpredictable and beyond one's own control (Kwok & Sullivan, 2006) and such experience is shaped by mystic factors such as destiny and fate (Allinson, 1989). In line with this cultural worldview, our findings show that Asians are more fatalistic about cancer prevention than European Americans. In particular, Asians had a stronger belief that "there's not much people can do to lower their chances of getting cancer", indicating a sense of helplessness to cancer prevention. Some qualitative work emphasises that fatalism in traditional Asian belief system does not mean complete passivity nor discourage people from taking preventive actions (Kwok & Sullivan, 2006). However, our findings suggest that fatalism in Asian culture can reduce the likelihood of adhering to prevention guidelines, especially in the domains of regular exercise and fruit and vegetable intake to prevent colon cancer.

Collectively, communicative interventions to lower Asian's fatalistic beliefs about cancer likely promote their adherence to colon cancer prevention behaviors. To increase Asian's adherence to regular exercise guideline, it may be useful to specifically address their sense of pessimism about cancer cause ("everything causes cancer"), helplessness ("not much one can do to lower cancer risk"), and confusion or information overload ("too many recommendations"). On the other hand, only the reduction of confusions on preventive measures has the potential to increase Asian's adherence to the fruit and vegetable intake guideline. Changing beliefs that are deep-rooted and reinforced by cultural worldview, however, may not be an easy task for health educators. Mystic factors such as fate and

destiny are more prevalent in Asian culture (Allinson, 1989), where there is a little concept of risk as it is commonly understood by Western populations. Thus, educational efforts that address the concept of risk could be useful to reduce fatalistic beliefs about cancer prevention.

Compared to European Americans, Asians were more likely to believe that they have a lower chance of getting cancer in both an absolute and a comparative sense consistent with prior research findings (Davis et al., 2013; Ji et al., 2004; Joshi & Carter, 2013). In light of the notion of naïve dialecticism (Spencer-Rodgers, Williams & Peng, 2010), Asians may be able to stay positive even when considering negative life events as they view life events in a more cyclical fashion. At the same time, comparative optimism has been attributed to cognitive bias (such as egocentrism) that occurs when a respondent compares one's own risk to that of similar other's (Rose, Endo, Windschitl & Suls, 2008). One possibility is that Asians are more susceptible to such cognitive bias than Western populations, focusing mostly on one's own unlikelihood but giving too little consideration to the comparison group, particularly in estimating the likelihood of negative, infrequent life events like developing cancer. This speculative explanation, however, warrants further research.

Regardless of culture, respondents were more likely to avoid smoking when they perceived higher absolute risk of getting cancer in their lifetime. The same pattern holds for sunscreen use but it did not reach the statistical significance. On the other hand, when respondents believed their own risk to be lower than similar others (comparative optimism), their likelihood of adhering to regular exercise and non-smoking guideline significantly increased (also marginally for sunscreen use). Similar findings were detected in another study, where researchers found that Asian participants were more comparatively optimistic about their flu infection risk, but were more likely to adopt precautionary actions than did North Americans who were less comparatively optimistic about their flu risk (Ji et al., 2004).

Some researchers have suggested that people's comparative risk judgments are often ordinarily accurate and do not have negative health implications, unlike unrealistic optimism (i.e., a mistaken belief considering one's actual risk) (Radcliffe & Klein, 2002). Researchers have found, for instance, those identified as comparative optimists had adaptive risk-related beliefs and were more knowledgeable about the given risk issue (Radcliffe & Klein, 2002). Our finding further suggests that comparative optimism among Asians can promote their adherence to three cancer prevention behaviors (regular exercise, avoid smoking, and fruit and vegetable intake). However, the opposite pattern holds for absolute optimism; absolute optimism among Asians reduced the likelihood of avoiding smoking. Combined, comparative optimism is conceptually distinct from absolute optimism, and thus has different implications for making behavioral decisions to reduce cancer risk. Health educators can better promote adherence to non-smoking guideline among Asians by addressing their objective risk of getting lung cancer; on the other hand, their comparative optimism should not be the target of interventions.

Study Limitations and Future Research

Several limitations are worth noting. First, we used cross-sectional data in examining the relationships between cancer-related beliefs and prevention behaviors. Our results thus cannot speak to the causal direction of the associations reported. Longitudinal panel or experimental studies can confirm temporal causal orderings proposed here. Second, we focused on fatalism and risk optimism as culturally influenced beliefs associated with cancer prevention. Yet, in light of the small effect sizes reported here, there may be other important cultural beliefs or worldview (e.g., religiosity, superstition; Lwin, Williams, & Lan, 2002) that has implications for cancer prevention. At the societal level, there may be differences in environmental factors (e.g., availability of sunscreen, educational program, and strict smoking prohibition) that promote or deter adherence to the prevention guidelines. Our

findings also suggest that the roles of fatalistic beliefs and risk optimism in explaining cultural disparity differ by the type of prevention behaviors. Future work should further explicate culturally influenced beliefs that have a meaningful role in explaining differences in adherence to the prevention guidelines.

Third, Asian participants were recruited from Singapore to match the socioeconomic status of the European American sample. Nonetheless, Singapore is not representative of Asia; in fact, higher adherence to non-smoking guideline may reflect strict smoking prohibition in Singapore. Also, low consumption of fruit and vegetable among Singaporeans may reflect their westernized diet living in an urban, developed country. More research is needed to better understand dietary practices in Singapore and other Asian countries, considering that the westernization of dietary intake has been suggested as a risk factor for colorectal and breast cancer among Asians (Nishi, 2014; Porter, 2008). Considering that Singapore is a multi-ethnic country, small effect sizes reported here could be an underestimate of the actual sizes that can be observed in other Asian countries such as China. Also, there may be differences between ethnic subgroups regarding cancer prevention beliefs and behavior. Beyond treating Asian as a single ethnic group, future work should address different cultural characteristics of ethnic subgroups to develop culturally targeted health messages.

Although health organizations in the US and Singapore have actively advocated for the evidence-based cancer prevention behaviors, generating widespread public awareness, we were unable to confirm whether our respondents were aware of the guidelines. Future studies should measure the actual level of awareness to better examine reasons for the adherence or not to the guidelines. Cancer prevention behavior measures lacked a specific timeframe and did not account for lifestyle differences between Asians and European Americans. Under report of regular (leisure time) exercise could be attributed to Asian's lifestyle that involves more physical activities in everyday life (e.g., commuting by subways and buses). Future

work should employ more accurate and comprehensive measurement items than those used in HINTS. Also, it would be important to develop targeted guidelines that account for lifestyle factors in different cultures and countries.

Lastly, this study utilized data from two sources using different data collection modes, which may have invited certain issues that hinder compatibility. To improve elderly representation in an online survey, we employed a quota sampling by age group. Also, we had similar response rates between online and mail surveys (35% vs. 33%, respectively). Although we controlled for demographic differences in our analyses, there may be other differing characteristics between the two samples. Future work should employ better approaches to ensure greater compatibility in making cultural comparisons.

Conclusion

Culture changes the way in which we make sense of our important life events. We examined culturally influenced beliefs about cancer risk and prevention, and their impact on the performance of four cancer prevention behaviors. Asians appear to be more optimistic about their cancer risk and to hold stronger fatalistic beliefs about cancer prevention, both of which may in turn translate into lower adherence to cancer prevention behaviors. Our findings underscore the need for developing culturally targeted interventions in communicating cancer causes and prevention.

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Table 1. *Sample Characteristics and Cancer Prevention Behaviors*

	<i>European American</i>	<i>Asian</i>
	<i>N = 1,139</i>	<i>N = 1,200</i>
<i>Socio-demographic characteristics</i>		
Female gender	60	51
Income		
Less than \$20,000	12.2	10.1
\$20,000 to 49,999	23.9	31.1
\$50,000 to 74,999	19.7	27
\$75,000 or more	44.3	31.8
Education		
High school diploma or less	19.7	14.8
Some college or technical school	29.8	35.6
College degree or higher	50.5	49.6
<i>Cancer Prevention behaviors</i>		
Regular exercise (3 or more days per week)	59.2	36.6
Non-smoker	81.4	84.5
Eat five servings of fruits & vegetables a day	18	7.8
Sunscreen use (often – always)	37.3	19.6

Notes. Non-weighted percentages.

Table 2. *Significant Univariate Effects for Cultural Background (N = 2,339)*

<i>Dependent Variable</i>	<i>df, df error</i>	<i>F</i>	<i>Cultural Background</i>	<i>M (SE)</i>
Everything causes cancer	1, 2158	7.98**	European American	3.38 (.04)
			Asian	3.53 (.04)
Not much can do to lower risk	1, 2158	139.96***	European American	2.31 (.04)
			Asian	2.91 (.04)
Too many recommendations	1, 2158	13.78***	European American	3.51 (.03)
			Asian	3.69 (.04)
Absolute risk perception	1, 2031	54.45***	European American	3.23 (.03)
			Asian	2.91 (.03)
Comparative risk perception	1, 2031	19.81***	European American	2.85 (.03)
			Asian	2.67 (.03)

Notes. Accounted for Age. ** $p < .01$, *** $p < .001$

Table 3. *Logistic Regression Results Predicting Cancer Prevention Behaviors (N = 2,339)*

	<i>Cancer Prevention Behaviors</i>							
	<i>Regular exercise OR (95% CI)</i>		<i>Avoid smoking OR (95% CI)</i>		<i>Fruits & vegetables intake OR (95% CI)</i>		<i>Sunscreen use OR (95% CI)</i>	
Asian (vs. European American)	.36***	.38***	1.44**	1.40*	.39***	.41***	.46***	.51***
Female gender (vs. Male)	.70***	.75**	1.65***	1.89***	1.13	1.11	3.45***	3.52***
Age	.99*	.99*	1.01	1.00	1.00	1.00	1.00	1.00
Income (less than \$20,000)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
\$20,000 to 49,999	1.26	1.20	1.35	1.33*	.76	.70	1.22	1.28
\$50,000 to 74,999	1.26	1.21	2.20***	2.23***	.99	.85	1.36	1.28
\$75,000 or more	1.31	1.24	2.08***	1.96**	1.01	.85	2.08***	2.04**
Education (high school or less)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Some college or technical school	1.12	1.06	1.70**	1.60**	1.55*	1.45	1.55**	1.61**
College degree or higher	1.12	1.04	2.73***	2.43***	1.90**	1.83*	2.05***	2.08***
Everything causes cancer		.91*		.86*		1.02		.99
Not much can do to lower risk		.90*		.97		.99		.93
Too many recommendations		.85**		.91		.88+		1.00
Comparative risk perception		.81**		.51***		.90		.86+
Absolute risk perception		.99		1.23*		.95		1.15+

Notes. OR = odds ratio (e^{β} , where β refers to individual regression coefficient), + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 4. *Mediation of Cultural Effects (Asian vs. European American) on Cancer Prevention Behaviors*

<i>Mediators</i>	<i>Cancer Prevention Behaviors</i>			
	<i>Regular Exercise</i>	<i>Avoid Smoking</i>	<i>Fruit & Vegetable Intake</i>	<i>Sunscreen Use</i>
Everything causes cancer	-.02 [-.04, -.002]	-.05 [-.10, -.02]	-	-
Not much can do to lower risk	-.06 [-.12, -.01]	-	-	-
Too many recommendations	-.03 [-.06, -.01]	-	-.03 [-.07, -.01]	-
Comparative risk perception	.04 [.02, .07]	.12 [.07, .18]	-	.03 [.002, .06]
Absolute risk perception	-	-.06 [-.12, -.01]	-	-.04 [-.09, .007]
<i>Total Indirect Effect</i>	-.07 [-.14, -.01]	.007 [-.07, .09]	-.03 [-.07, -.01]	-.01 [-.05, .03]

Notes. Point estimate of indirect effects [bias corrected 95% confidence interval] with 5,000 bootstrap samples. Controlled for significant demographic factors.