An Investigation of Factors Influencing Chinese Young Women’s Intention for Mammography Screening

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Abstract
China has witnessed a dramatic increase in breast cancer incidence over the past few decades. Clear evidence has proven the effectiveness of mammography screening in reducing the number of breast cancer–related deaths. The study aims to extend the theory of planned behavior (TPB) with two additional components, personality traits and attention to media, to investigate the factors related to young Chinese women’s intention for mammography screening. A cross-sectional web survey was conducted among female students (n = 1,002) in a large public university in southwest China. Hierarchical regression analysis showed that the three original TPB variables (attitudes, subjective norms and perceived behavioral control) have the strongest relationship with women’s intention to engage in mammography screening. Moreover, extraversion and attention to new media are positively associated with intention for mammography screening. The study contributes to existing health communication literature by showing how the original TPB model cooperated with psychological and communication factors that are related to women’s intention for mammography screening. The findings can be used to assist government and health professionals in developing a more effective strategies to promote mammography screening in the context of China.

Keywords
motivation, breast cancer, TPB, personality, media attention

Introduction
Breast cancer has become the most prevalent cancer among women and poses a significant health threat worldwide (World Health Organization, 2019). High incidence rates are often reported among women in Western countries, whereas women in Asian countries have lower prevalent rates of breast cancer. However, as the largest developing country, China has witnessed a dramatic increase in breast cancer incidence over the past few decades (Huang et al., 2001). An estimate of 268,600 Chinese women were diagnosed of breast cancer and 69,500 died in 2015, accounting for 15.1% of new cancer cases and 6.9% of cancer deaths in women (W. Chen et al., 2016). In fact, breast cancer has become the most common cause of cancer mortality among Chinese women since 2003 (Zhao et al., 2011).

Early detection and early treatment are important approaches for breast cancer prevention. Clear evidence from previous clinical trials has proven the effectiveness of screening methods, such as mammography, ultrasound, and clinical breast examination, in reducing the number of breast cancer-related deaths (Giampietro et al., 2020; Nelson et al., 2016; Schopper & de Wolf, 2009). In response to the high incidence, Chinese government has started to launch several large-scale breast cancer screening programs in recent years (Hao et al., 2009; Song et al., 2015; Y. Wang et al., 2019). However, a nationwide screening program remains unavailable in China because of the insufficient funding and widely dispersed population. As a result, women in China still have a lower screening rate for breast cancer than those in the United States and Europe (Fan et al., 2014). A 2010 study reported that the overall breast cancer screening rate in China was only approximately 21.7% (B. Wang et al., 2013).

Age is an important prognostic factor in breast cancer (Host & Lund, 1986), but an agreement on the best age thresholds to start with regular mammography screening has yet to be reached. Many guidelines recommend annual mammography screening in women 40–49 years old (Ray et al., 2017), but the recommendations for younger women are unclear. Chinese women are diagnosed with breast cancer at
an earlier age than Western White women (Co & Kwong, 2020; Song et al., 2014). For instance, the median age of patients diagnosed with breast cancer in China is nearly 10 years earlier than those in the United States and European Union (Song et al., 2014). Young Chinese women nowadays also have a higher risk of breast cancer than previous generations, which might be caused by reproductive changes (such as fewer children and less breastfeeding) and adoption of Western lifestyles (Fan et al., 2014; Linos et al., 2008). Furthermore, evidence suggests that breast cancer patients aged 34 years or less have a significantly lower survival rate than those in the older age groups (Nixon et al., 1994; Tsuchiya et al., 1997). Kwong et al. (2008) also argued that young patients with breast cancer in China present with more advanced disease and aggressive tumor characteristics. Therefore, the behavior intention of young Chinese women for mammography screening needs to be promoted.

Research exploring the factors that motivate women’s screening intention has largely been conducted in Western countries, and relevant data about Chinese women remain relatively limited. The current study aims to use a theory-driven approach and adopt an extended theory of planned behavior (TPB) model to identify the potential factors that might motivate young Chinese women’s intention for mammography screening. The results may help health professionals develop a comprehensive and effective strategy to promote mammography screening for this group of people.

Theoretical Background and Hypothesis Development

TPB

TPB (Ajzen, 1988, 1991) is a commonly used theory in research of health behavior promotion. Compared with other popular theories, such as Health Belief Model (Rosenstock, 1974), which mainly concerns on intra-personal factors, TPB further incorporates cultural factors and the perception of external factors in understanding the behavior decision (Taymoori et al., 2015). TPB may serve as a more useful framework in the current study because its social and external factors are important toward efforts to improve the early detection of breast cancer among Chinese women. Several recent studies have applied the TPB model in understanding the engagement of mammography screening among diverse groups (Drossaert et al., 2003; Rutter, 2000; Taymoori et al., 2015).

According to TPB, individual’s intention is an important and proximal predictor of actual behavior (Ajzen, 1988). Meanwhile, attitude toward behavior, subjective norms, and perceived behavior control are the primary influences on one’s intention to perform a behavior. Attitudes refer to a person’s evaluation of a behavior, subjective norms measure his or her perceived social pressure to engage or not to engage in a behavior, and perceived behavior control describes his or her perception of the ease or difficulty of performing the behavior. Considerable studies have supported the significant effects of the three predictors on health-related intentions, such as healthy eating behaviors (Fila & Smith, 2006), human papillomavirus (HPV) vaccination intentions (Catalano et al., 2017), and exercise maintenance (Ahmad et al., 2014). In the research of mammography screening, Kobeissi et al. (2014) found that attitude has a significant effect on future intention to screen among immigrant Iranian women residing in the United States. Moreover, breast self-examination intention is significantly correlated with subjective norms among university students in Indonesia (Dewi & Zein, 2017). Perceived behavioral control is also a significant predictor of mammography intention among Cypriot women (Tolma et al., 2006). Based on the above literatures, the following three hypotheses were proposed in the context of Chinese women:

Hypothesis 1 (H1): Attitude toward mammography screening is positively associated with Chinese Young Women’s intention to perform mammography screening.

Hypothesis 2 (H2): Subjective norms are positively associated with Chinese Young Women’s intention to perform mammography screening.

Hypothesis 3 (H3): Perceived behavioral control is positively associated with Chinese Young Women’s intention to perform mammography screening.

Extending TPB With Personality Traits

Ajzen (1991), the founder of TPB, suggested that personality traits are important external concepts to TPB, which also predict and explain human behaviors. Personality traits are a multi-dimensional construct that comprises five main dimensions: neuroticism, extraversion, agreeableness, conscientiousness, and openness to experience (Costa & MacCrae, 1992). Among the five dimensions, the effects of neuroticism and extraversion have often been assessed on health-related behaviors, such as adolescents’ exercise behaviors (Rhodes et al., 2002) and intention to adopt privacy protection behaviors (Ho et al., 2017). Neuroticism represents the tendency to experience unpleasant and disturbing moods, as well as poor emotional adjustment (Friedman & Schustack, 2016). Extraversion has a core concept of positive affect and characterized by talkativeness, sociability, and outgoingness.

Although TPB has been widely used in health-related behavior research, many studies have attempted to include additional components to the model to predict intentions and behaviors favorably under different contexts (e.g., M.-F. Chen, 2017; Rhodes & Courneya, 2003; D.-L. Wang et al., 2017). Review of the literature suggests that the TPB framework can be extended to include personality and media factors in the context of mammography screening among young Chinese women. These factors will be elaborated in the following sections.

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Hypothesis 4 (H4): Neuroticism is negatively associated with Chinese Young Women’s intention to perform mammography screening.

Hypothesis 5 (H5): Extraversion is positively associated with Chinese Young Women’s intention to perform mammography screening.

Extending TPB With Media Attention

Media attention refers generally to people’s inclination to focus cognitive resources on particular types of message on mass media platforms, such as newspaper, television, or social media. Framing theory (Goffman, 1974) is an influential communication theory that implies that the messages on mass media could impact an individual’s attitude and behavior. Framing is a dynamic process of constructing meaning in messages and makes them more salient in a communicating text, in such a way as to influence the choices individuals make about how to process that information (Entman, 1993; Smith & Petty, 1996). With the potential persuasive effects on opinion and attitude, media framing is often used to promote behavior changes in health communication research (Keyworth et al., 2018; Lovejoy et al., 2015; Yoo et al., 2018). Exposure and attention to media are necessary conditions for the influence of media framing (McGuire, 1989). Thus, individuals with great media attention to health information may have high intentions to follow the behavior recommended in the media. Wakefield et al. (2010) have reviewed the past studies on outcomes of exposure to traditional media campaigns, such as television, radio, and newspapers, in the context of various health-risk behaviors. Their findings indicated that exposure to traditional media campaigns can produce positive changes or prevent negative changes in health-related behaviors across large populations (Wakefield et al., 2010). Similar media effects on health behavior were also found in attention to new media, such as the internet and social media. For instance, studies suggest that social media play a role in reducing certain risk behaviors, such as smoking (Christakis & Fowler, 2008) or alcohol consumption (Rosenquist et al., 2010). The increasing popularity of social media sites, such as Facebook and Twitter, allows users to report personal experiences, ask questions, and receive direct feedback for health problems. New media with high interactivity are particularly effective at promoting positive health behaviors (Levac & O’Sullivan, 2010). In the current study, we have included media attention in the theoretical framework of TPB to test whether or not traditional and new media attention affect young Chinese women’s intention to mammography screening. The following two hypotheses are proposed:

Hypothesis 6 (H6): Traditional media attention is positively associated with Chinese Young Women’s intention to perform mammography screening.

Hypothesis 7 (H7): New media attention is positively associated with Chinese Young Women’s intention to perform mammography screening.

Method

A cross-sectional web survey was conducted in a large public university in southwest China to test the hypotheses. We only targeted on full-time female university students who are aware of breast cancer. The fieldwork lasted for a week in May 2018. The study is a preliminary work for a larger project on this topic, and we initially used convenience and snowball sampling to recruit respondents. An invitation poster with a QR code of the survey was distributed in all women’s dormitories of the university. To gather data, respondents were also asked to invite their classmates who meet the inclusive criteria to take the survey. Respondents provided informed consent before starting the survey. The survey did not obtain names or other personally identifiable information to protect participants’ privacy. The respondents completed the survey in approximately 10 min.

A total of 1,002 valid respondents were collected for data analysis. The mean age of participants was 21.22 years old (SD = 2.52 years). Majority of them (76.4%) were undergraduate students, and the rest were master students. They were full-time students with diverse major background, such as humanities, science, and engineering, as well as social sciences. All of them were aware of breast cancer, and 154 respondents (15.4%) reported that their family have a history of cancer.

Measures

In general, the questionnaire was initially prepared in English and later translated into Mandarin based on the translation procedure recommended by the World Health Organization (2018). Demographic information including age and grade were collected and used as control variations in the analysis.
**Intention to mammography screening** was evaluated by using two questions adapted from Lee et al. (2013), and Kim and Nan (2016). Respondents were asked to answer these questions based on a 5-point Likert-type scale that ranges from “least likely” to “most likely.” Example question includes “How likely would you be to go for mammography screening in the future?” To determine the overall index of intention to mammography screening (M = 3.54, SD = .85, Cronbach’s α = .77), ratings on two questions was averaged. Higher scores indicate greater intentions toward taking mammography screening.

**Extraversion** was evaluated by three statements adapting from Rammstedt and John (2007). Respondents were asked to rate their agreement with these items on a 5-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). Sample items include the following: “I see myself as some-one who is outgoing, sociable” and “I see myself as extra-verted, enthusiastic.” All three items were averaged to form a composite scale of extraversion (M = 3.21, SD = .87, Cronbach’s α = .82).

**Neuroticism** was evaluated by three statements adapting from Rammstedt and John (2007). Respondents were asked to rate their agreement with these items on a 5-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). Sample items include the following: “I see myself as some-one who gets nervous easily” and “I see myself as anxious, easily upset.” All three items were averaged to form a composite scale of neuroticism (M = 3.19, SD = .73, Cronbach’s α = .70).

**Attitude** toward taking mammography screening were measured by two semantic differential items. With the statement “Having mammography screening every two year is,” subjects rated on two 5-point bipolar adjective scales: (a) very harmful–very beneficial and (b) very foolish–very wise. The composite index of attitude (M = 3.76, SD = .71, Cronbach’s α = .86) was calculated by averaging the score of these two items. Higher scores indicate more positive attitude toward taking mammography screening. All items were adapted from Kim and Nan (2016).

**Subjective norms** were evaluated by four items adapting from Ho et al. (2015). Respondents were asked to rate their agreement with these items on a 5-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). Sample items are as follows: “Most of the people who are important to me would recommend me to have a mammography every two years” and “people who are close to me expect me to have a mammography every two years.” The mean score of the responses to the four items created the index of subjective norm (M = 2.87, SD = .76, Cronbach’s α = .84).

**Perceived behavioral control (PBC)** was measured by four items adapting from Ho et al. (2015). Respondents were asked to rate their agreement with these items on a 5-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). Sample items are as follows: “It is possible for me to have a mammography screening every two years” and “it is up to me whether I go for mammography screening or not.” The score of these two items was averaged to create the composite index of PBC (M = 3.42, SD = .66, Cronbach’s α = .75).

**Attention to traditional media** was evaluated by two questions adapted from Lin et al. (2017). Respondents were asked to indicate how much attention they pay to news stories related to breast cancer (a) in print newspaper and (b) on television (1 = no attention at all, 5 = very close attention). The overall index of attention to traditional media (M = 2.41, SD = .70, Cronbach’s α = .66) was generated by averaging the score of two questions.

**Attention to new media** was evaluated by two questions adapted from Lin et al. (2017). Respondents were asked to indicate how much attention they pay to news stories related to breast cancer (a) on the internet and (b) on social media (1 = no attention at all, 5 = very close attention). The overall index of attention to new media (M = 2.73, SD = .74, Cronbach’s α = .83) was generated by averaging the score of two questions.

**Data Analysis**

IBM SPSS Statistics version 25 was used to analyze the collected data. A descriptive analysis of variables was conducted to illustrate the means and standard deviation of each involved variable. Subsequently, hierarchical ordinary least squares regression analysis was performed to determine the relative impact of the factors that influence participants’ intention to engage in preventive measures to breast cancer. Three blocks were included in the regression analysis based on the presumed causal order. Demographic variables were entered in the first block, followed by personality variables (neuroticism and extraversion) in the second block, TPB items (attitude, subjective norms, and perceived behavioral control) in the third block, and media attention (new media and traditional media attention) in the last block. The significant level used in the study was 0.05, with a one-sided p value.

**Results**

The bivariate relationships for main variables are presented in Table 1. It is clear that most of the key variables are significantly correlated with each other. Test of normality was first performed before the final analysis, which indicates that normality assumption was met for linear regression. Table 2 presents the results of the regression analysis predicting individual’s intention to mammography screening. At the zero-order level, most of the independent variables were significantly associated with the outcome variable. As for the results of regression analysis, all control variables were not statistically associated with individual’s intention to engage in mammography screening. All the original TPB variables including attitude (β = .22, p < .001), subjective norm (β = .17, p < .001), and PBC (β = .26, p < .001) were positively associated with participants’ intention to have mammography...
screening, lending support for H1, H2, and H3. These three variables explained a total of 30.60% of the variance of the dependent variable. Regarding the predictive power of personality traits, the regression results showed that extraversion ($\beta = .10, p < .001$) was positively associated with intention to have mammography screening, whereas neuroticism was not statistically related to it. Thus, H4 was supported but H5 was not supported. This Block explained 3.60% of the variance of the dependent variable. For the communication factors, attention to new media ($\beta = .16, p < .001$) was found to be positively associated with intention to have mammography screening, while news attention to traditional media have no significant association with it. As a result, the findings supported H7 but not H6. This block explained 2.80% of the variance of the dependent variable. In total, the entire regression block explained 37.40% of the total variance in individuals’ intention to engage in mammography screening.

### Discussion and Conclusion

This study examined the role of the TPB variables, personality traits, as well as attention to traditional media and new media in affecting young Chinese women’s intention for mammography screening.

Consistent with prior research where TPB was used to understand the engagement of mammography screening among diverse groups (Drossaert et al., 2003; Rutter, 2000; Taymoori et al., 2015), the results showed that attitude, subjective norm,
and perceived behavioral control are positively associated with young Chinese women’s intention for mammography screening. The results are in line with the TPB model that argues that the individuals’ behavior intention is influenced by their attitude, subjective norm, and perceived behavioral control (Ajzen, 1991). The results suggest that young Chinese women are more likely to have greater intention for mammography screening if they hold a positive attitude toward it, perceive beliefs where social agents approve of such behaviors, and feel that mammography screening is within their control. Moreover, this study found that TPB factors (i.e., attitude, subjective norm, and perceived behavioral control) explain more than 30% of the variance in individuals’ intention for mammography screening. This finding implies that, although the additional variables affect their intention for mammography screening, the original TPB model is still robust in predicting behavioral intention in the context of mammography screening research in China.

In addition to the original TPB factors, this study also emphasizes personality as an important predictor of women’s intention for mammography screening. Notably, extraversion was positively associated with individuals’ intention for mammography screening. The finding is consistent with prior studies in health enhancing behaviors, such as healthy diet or regular exercise (Joyner et al., 2018; Mroczek et al., 2009). That is, women tend to engage in mammography screening if they are high in extraversion, such as enjoys being around people more than being alone. However, inconsistent with previous studies (Arai et al., 2009; Neeme et al., 2015), our study did not find a significant association between neuroticism and intention for mammography screening. On possible reason may be that the influence of neuroticism on intention for mammography screening is indirect, which may be mediated by other factors, such as risk perception of developing breast cancer. In this case, future research is required to confirm this non-significant association between neuroticism and intention for mammography screening.

Regarding the association between news attention and screening intention, the study found that attention to breast cancer news on new media was positively associated with young Chinese women’s intention for mammography screening. This finding is in line with the framing theory that implies that news messages on media outlets could impact people’s attitude and behavior (Goffman, 1974). A previous study suggested that new media with high interactivity is particularly effective at promoting positive health behaviors (Levac & O’Sullivan, 2010). The current study further confirmed that disseminating breast cancer-related news information on new media platforms, such as websites or social media, could effectively encourage women to undergo mammography screening. However, different from the expectation, attention to breast cancer-related news on traditional media (e.g., newspaper and television) did not significantly predict intention for mammography screening. This result might be possibly attributed to the university student sample.

University students often consume more new media contents and perceive the online information as more important and credible compared with their older counterparts (Lin & Hong, 2015). Taking together, disseminating relevant news on new media platforms can be more effective than traditional media on prompting young Chinese women’s intention and behaviors for mammography screening.

This study brings to light several theoretical and practical implications. First, this study contributes to existing health communication literature by showing how the original TPB model cooperated with psychological and communication factors that are related to women’s intention for mammography screening. The significant factors identified from this study can be used to understand other health issues, such as the public’s intention to take preventive measures toward other diseases. Second, this study supports previous research (Drossaert et al., 2003; Rutter, 2000; Taymoori et al., 2015) by showing the influential effects of TPB models on mammography screening intention among Chinese young women. As such, the applicability of the TPB model in explaining the related behavioral intention is extended to a particular age group in a different geographical context. Third, the findings from the current study are useful to health professionals and media practitioners in understanding young Chinese women’s intention for mammography screening and in fine-tuning strategies to promote mammography screening. For instance, considering that attitude exerts a significant impact on intention for mammography screening, health authorities can implement campaigns to increase the public awareness of mammography screening, which can help build favorable attitudes toward mammography screening. Moreover, given that disseminating relevant news on new media platforms can be more effective than traditional media on increasing young women’s intention toward mammography screening, communication practitioners should focus on using new media platforms to run campaigns encouraging women to undergo regular breast mammography screening.

Several issues in this study should be addressed. First, the non-probability sampling technique used in the current study limits the result generalization. Second, the cross-sectional data used in the current study only capture a snapshot of the dynamic opinions of respondents. Such data collection approach also limits the extent to which we can lay claims about the causal relationships among the variables. Strict experimental designs and longitudinal data should be used in future studies to rigorously establish the direction of causality. Finally, although the predictors have explained a large proportion of the variance in the current study, other antecedent factors of regular mammography screening intention, such as knowledge toward breast cancer and mammography screening and risk perception about developing breast cancer, should be investigated in future studies.

In conclusion, the current study has provided a better understanding of the factors that motivate young Chinese women’s intention for mammography screening. The
findings have extended the theoretical knowledge and inspired health practitioners to design effective strategies to prevent breast cancer among young women.

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**Ethical Approval**
The study used the Declaration of Helsinki as a basis of conducting ethical human subjects’ research. Accordingly, respondents provided consent before starting the survey and no personally identifiable information was collected to ensure anonymity. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

**Statement Regarding Informed Consent**
Informed consent was obtained from all individual participants included in the study.

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