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Factors associated with Chinese American and White cancer survivors' physical and psychological functioning

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Abstract

Objective.—To examine whether health-related stressors and resources are associated with physical function, depression, and anxiety in Chinese American and White breast cancer survivors.

Methods.—During 2011-2013, this cross-sectional study enrolled Chinese American and White women from California cancer registries diagnosed with stage 0-III breast cancer between 2006-2012. Survivors completed a telephone survey assessing health-related factors including comorbidity, treatment-related symptoms, medical communication, perceived threat, use of coping, and social support resources. Outcomes were assessed using the patient-reported outcome measurement information system (PROMIS) short forms. Chinese were classified as low- or high-acculturated based on English proficiency, years in the US, and interview language. Analyses were conducted using Tobit regression models.

Results.—Low-acculturated Chinese (n=136) had worse physical functioning than Whites (n=216), controlling for demographics, cancer stage, and time since diagnosis ($\beta=-3.33$, $p=0.01$). This disparity was attenuated after adjusting for comorbidity and symptoms ($\beta=-1.63$, $p=0.18$). Perceived threat, disengagement coping, and lack of social support were associated with poorer psychological outcomes, regardless of ethnicity. Although low-acculturated Chinese had lower scores on all health-related factors than Whites, the former reported significantly lower level of depression ($\beta=-3.23$) and anxiety ($\beta=-5.8$) after adjusting for covariates (both $p<.05$). High-acculturated Chinese (n=84) did not differ from Whites except that the former had significantly lower anxiety.

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Conclusion.—Low-acculturated Chinese may benefit from interventions aimed to improve their physical problems. However, despite experiencing greater psychosocial stress, they reported better emotional functioning. Whether Chinese culture shapes this resiliency, or if it is a reporting bias will need further investigation.

Introduction

Physical, psychological, and social sequela of cancer treatment are indicators of quality of life (QoL) among cancer survivors (Ganz et al., 2002; Holland, 2003). Multiple theoretical frameworks have identified stressors and resources that adversely impact QoL among cancer survivors. Ganz (2006) and Kornblith (1998) postulated that physical stressors such as ongoing cancer treatment-related symptoms and comorbidities are detrimental to cancer survivors' daily functioning. Kornblith (1998) and Epstein and Street (2007) delineated the importance of the quality of patient-doctor communication (medical communication stressor) to prevent, alleviate, and manage physical and psychological symptoms. Research based on stress-coping theory (Lazarus & Folkman, 1984) has highlighted the role of appraisal of cancer threat as a driver of psychological response to stress (psychological stressor), which can affect QoL (Janz et al., 2014). Finally, social network theory emphasizes the role of social resources and support in allowing cancer survivors to obtain needed information and care (Kroenke et al., 2013). While these theories have been widely applied and tested in White survivors, they have not yet been incorporated and applied toward understanding Asian Americans' cancer survivorship.

Asian American cancer survivors may experience these stressors and resources in qualitatively and quantitatively different ways from White cancer survivors (Bellizzi et al., 2012; Bowen et al., 2007; Wang et al., 2013a). Research has indicated that minority survivors are less likely to effectively communicate their symptoms to doctors, leading to more unresolved symptoms (Maly, Liu, Leake, Thind, & Diamant, 2010; Wang et al., 2012). Asian American cancer survivors, especially immigrant survivors, consistently show poorer medical communication and care than other ethnic groups (Ayanian et al., 2010; Palmer et al., 2014). This may in part be because Asian immigrants, oriented toward collectivism, value interdependence and conformity to authority to facilitate social harmony (Ho, 1986). Thus, they tend to exhibit respectful but submissive communication styles with doctors (Kagawa-Singer & Blackhall, 2001; Wang et al., 2013b). In addition, research suggests that Asian cancer survivors' stress appraisal and coping repertoire may differ from White survivors due to differences in cultural beliefs and exposure to medical and social resources (Dhooper, 2003; Wang et al., 2013a). For Chinese, cancer is considered a life threat that impacts survivors and their family's well-being (Wang et al., 2013a). Moreover, for immigrants with limited English proficiency, low acculturation likely inhibits proficiency in navigating the healthcare system as few healthcare resources are available in Asian languages (Dhooper, 2003). This results in limited coping resources. These factors may affect immigrants' stress appraisals and impact their QoL.

Little research has investigated cultural differences and survivorship experiences. Culture is a complex concept (Kagawa-Singer M., Dressler, & George, 2016). Assessing immigrants' acculturation level is one way of capturing cultural influence on immigrants' health (Salant

& Lauderdale, 2003). Chinese Americans, the fastest growing immigrant population in the United States (US Census Bureau, 2014), have increasing rates of breast cancer incidence (Gomez et al., 2017). This study examined 1) whether physical and psychological (depression and anxiety) functioning outcomes differed between Chinese American (distinguished further by acculturation level) and Non-Hispanic White (NHW) breast cancer survivors, and 2) whether these differential outcomes were explained by ethnic differences in health-related stressors and resources.

Methods

Guided by the vulnerability model, stress-coping theory, and social network theory (Heaney & Israel, 2008; Korblith, AB, 1998; Lazarus & Folkman, 1984), the full study employed a mixed-methods research design to collect qualitative and cross-sectional survey data. The current paper focuses on the survey data. All English survey measures were translated into Chinese. Qualitative research results confirmed the face validity of survey instruments for Chinese patients (Wang et al., 2013a; 2013b). This study was approved by the Institutional Review Boards at Georgetown University Medical Center, the California Health and Human Services Agency, and the Cancer Prevention Institution of California.

Study population

A total of 436 breast cancer survivors (220 Chinese American and 216 NHW) completed a cross-sectional survey. All were over age 20 when diagnosed with stage 0-III breast cancer between 2006 and 2012, and had completed primary treatment (surgery, radiation, and chemotherapy) within 1-5 years, without recurrence or other cancers. Breast cancer cases were randomly selected from the Greater Bay Area and Los Angeles cancer registries between 2011 and 2013. The NHW cases were age-matched (±5 years) to Chinese cases. Participants were mailed an opt-in or -out form (n=1,910), and after 10 business days, follow-up telephone calls were made to those who had not yet returned the form. The overall response rate was 44% (35% for Chinese and 60.5% for NHW), similar to the rates reported in prior cohort studies enrolling multi-ethnic cancer survivors (Kolonel, et al., 2000). About 70% of the Chinese sample were telephone interviewed in Mandarin or Cantonese. The rest were interviewed in English.

Measures

Dependent/outcome variables.—Patient-reported outcome measurement information system (PROMIS) customized short forms (Jensen et al., 2017a; 2017b) were used to assess physical function, depression, and anxiety. The PROMIS customized short forms have been previously translated into Chinese and validated in large multi-ethnic cancer patient populations (Jensen et al., 2017a; 2017b). *Physical function* assessed survivors' current ability to perform activities ranging from household chores (e.g., carrying groceries) to more strenuous exercise (e.g., lifting heavy objects). *Depression* examined survivors' negative mood, self-criticism (e.g. feelings of failure), and decreased positive affect (e.g. hopelessness) in the past seven days. *Anxiety* measured survivors' feelings of fear and worry, and hyperarousal symptoms (e.g., nervousness) in the past seven days. The response format was a Likert-type 5-point scale. All scores were normalized into T-scores per the

PROMIS scoring method (Assessment Center Scoring Service, 2011); higher mean scores indicate higher physical function, depression, and anxiety. Cronbach's alphas were greater than .90 for each of the PROMIS scales in both cultural groups (Table 2).

Independent variables.

Two physical stressors were assessed:

comorbidity and treatment-related symptoms.: Using Charlson et al. (1987)'s index, comorbidities were categorized into three levels: 0, 1, and 2+ comorbidities. A total of 34 breast cancer treatment-related symptoms were compiled based on items from the Memorial Symptom Assessment Scale (Lam et al., 2008) and the breast cancer prevention trial (Cella et al., 2008). Survivors reported the presence of each symptom (e.g., joint pain or fatigue) within the previous 12 months as in previous research (Alfano et al., 2006; Cella et al, 2008). For analysis, survivors' responses were divided into two categories using a median split: having <5 symptoms and ≥5 symptoms.

Medical communication was assessed by a 10-item scale that examined cancer survivors' perception of communication quality with their doctor (e.g., does your doctor listen to your questions? 1="never" to 4="always") (Arora, Reeve, Hays, Clauser, & Oakley-Girvan, 2011). Higher scores indicate better communication.

Perceived threat was assessed by two variables:

perceived severity and perceived control of breast cancer.: The Consequences Subscale of Revised Illness Perception Questionnaire was used to assess perceived severity of breast cancer on financial, social, medical, and psychological wellness (e.g., "Your breast cancer is a serious condition", 1="strongly disagree" to 5="strongly agree") (McGinty, Goldenberg, & Jacobsen, 2012; Chen, Tsai, & Lee, 2008 for the Chinese version). Using a validated 5-point scale (Arora, Weaver, Clayman, Oakley-Girvan, & Potosky, 2009), breast cancer survivors' perceived control was examined over four aspects: 1) emotional response, 2) treatment-related symptoms, 3) follow-up care options, and 4) the course of cancer.

Coping was assessed by the Brief COPE scale (Carver, 1997) and characterized into two types: 1) *engagement coping* (i.e., active coping, planning, use of instrumental support, and positive framing) and 2) *disengagement coping* (i.e., denial, behavioral disengagement, and substance use) following Yang, Brothers, and Anderson's (2008) definition. This scale has been used to examine various diseases in Chinese-speaking samples (Han, et al, 2014).

Three aspects of social resources were measured:

survivors' socioeconomic well-being (SWB), receipt of social support, and social network.: SWB refers to survivors' material capital (e.g., I am able to make enough money to pay for my cancer care) and social capital (e.g., I understand the healthcare system) (Wang et al., 2013a). Participants responded to each item (1="not at all" to 5="very much"). Social support was a summed score of emotional support and tangible support sub-scales of the Medical Outcomes Study- Social Support Survey (Sherbourne & Stewart, 1991; Shyu, Tang, Liang, & Weng 2006 for Chinese version). The Social Network Index was used to count a total number of immediate family members, relatives, friends, neighbors, and community

groups one sees or talks to at least once every two weeks (Cohen, Doyle, Skoner, Rabin, & Gwaltney, Jr., 1997; 2014).

Control variables.—Patient-reported demographics (e.g., race/ethnicity, education, and health insurance) were collected. Chinese American survivors were further classified as high- or low-acculturated to the United States (US) based on three commonly used proxies for acculturation: English proficiency, interview language, and length of years in the US (Ellison, Jandorf, & Duhamel, 2011; Lee, Nguyen, & Tsui, 2011; Salant & Lauderdale, 2003). To qualify as high-acculturated, Chinese must have been interviewed in English or exhibited good proficiency in speaking, listening, reading, and writing English, and lived in the US for 25 years or more (median for the sample); otherwise, they were considered low-acculturated. To reduce participants' burden of answering a lengthy survey, English proficiency was assessed using the Anderson et al. (1993) short English acculturation survey. Using the 25-year median split is consistent with a prior report that Hispanic immigrants usually take over 20 years to be behaviorally acculturated to US society (Anderson, 2009). These proxies have been used to assess the level of acculturation and financial distress among Chinese American breast cancer survivors (Wang et al, 2013a). Clinical variables (e.g., cancer stage, age at diagnosis, and primary treatment types) were provided by cancer registries.

Data Analysis—To examine differences in demographic and clinical variables among the NHWs, high-acculturated Chinese, and low-acculturated Chinese, one-way ANOVA with post-hoc Tukey range tests were performed. Since non-normal distributions of the residuals of all PROMIS variables (continuous scores) were found even after performing standard transformations (Box & Cox, 1964), the Tobit/censored regression method (Austin, Escobar, & Kopec, 2000; McBee, 2010) was performed to examine the associations between the independent variables and each PROMIS outcome separately. Chinese Americans' acculturation groups were dummy coded in the regression models to compare with NHWs. The Tobit model is based on the assumption that a latent variable underlies observed dependent variables (Tobin, 1958). To understand how much variance in the outcomes was explained by each of the stressors and resources, the regression models were constructed using hierarchical entry methods: 1) including covariates that were confounders of the outcomes (e.g. age and time since diagnosis; Ganz, et al., 2002; Stover, Mayer, Muss, Wheeler, Lyons, & Reeve, 2014) and that significantly differed across groups in the base model, 2) adding the two physical stressor variables to the base model, 3) adding the communication variable to Model 2, 4) adding stress-coping variables to Model 3, and 5) adding social resources variables to Model 4. The sample size (N=436) was sufficient to test the final regression models with 16 independent variables, with a power of .08 to explain at least 13% of the variance of each outcome (a medium effect size; Green 1991). Income was excluded because 8% of the values were missing and income was highly related to educational level and employment status (both $p<.0001$). Variance Inflation Factors (VIF) showed no significant multicollinearity among these variables. The variables were entered in line with Kornblith's (1998) and Epstein and Street's (2007) conceptual frameworks, where physical stressors induce communication with clinicians, which may affect patients' psychological response to cancer. These individual factors were included prior to examining

the impact of social resources. The coefficient estimates from censored regression models were similar to non-censored regression models. However, the former models showed a better goodness-of-fit to the data than the latter. An adjusted pseudo R^2 of each model based on the latent variable as proposed by McKelvey and Zavoina (1975) was reported, which allowed for similar interpretation of adjusted R^2 as in ordinary least squares regression. All analyses were conducted in STATA 14.2.

Results

NHW survivors had similar demographic characteristics to high-acculturated Chinese survivors (Table 1). However, low-acculturated Chinese survivors were less likely to be college-educated ($p<.0001$), employed ($p<.001$), and high-income ($p<.0001$) than both high-acculturated Chinese and NHW survivors. They were also more likely to have more than two comorbidities (56.62%) and five or more treatment-related symptoms (66.18%) than NHW survivors (38.43% and 53.24%, respectively, both $p\leq.05$). There were not significant differences in the two physical stressors between high-acculturated Chinese and NHWs. Regardless of acculturation status, more Chinese American survivors had stages II or III breast cancer (~31%) than NHW survivors (18.52%, $p<.001$). The groups did not differ on type of treatment received.

NHW and high-acculturated Chinese survivors did not differ on any of the PROMIS outcomes or on independent variables, except that NHWs reported better medical communication with their doctors (Table 2). In contrast, low-acculturated Chinese survivors reported poorer physical function than NHWs (means=49.39 vs. 52.62, $\Delta=3.23$ points, $p<.05$). Neither Chinese group differed in its mean scores on depression and anxiety from NHWs. However, low-acculturated Chinese reported poorer medical communication and SWB, perceived lower control over breast cancer, used more disengagement coping, and received less social support than NHW and high-acculturated Chinese survivors (all $p<.05$). They also perceived greater severity of breast cancer and had smaller social networks than NHWs ($p<.05$).

Physical function multivariable regression results.

Low-acculturated Chinese' physical function was significantly poorer than NHWs even after controlling for demographic and clinical variables ($\beta=-3.33$, $p=.01$). However, this difference was attenuated after adjusting for differences in physical stressors ($\beta=-1.63$, $p=.18$) and further attenuated by adding the medical communication variable to the model ($\beta=-0.45$, $p=.70$) (Table 3). The association between communication and physical function was no longer significant after controlling for psychosocial variables. Results from the final model showed that survivors who were younger, had fewer comorbidities and symptoms, and better SWB, had better physical function. The two physical stressors explained the most variance in physical function among all other variables (Δ adjusted $R^2=16\%$ between Models 1 and 2).

Depression and anxiety multivariable regression results.

The low-acculturated Chinese group had significantly lower depression levels in the final model after simultaneous adjustment for all psychological and social variables (p=.03, Table 4). Across groups, survivors who perceived higher severity and lower control, used more disengagement coping, had less social support, were more likely to be depressed (all p<.05).

Similarly, both high- and low-acculturated Chinese had significantly lower anxiety than NHWs in the final model after adjustments (both p<.05, Table 5). Anxiety was positively associated with education, perceived severity, and disengagement coping, and negatively associated with perceived control and social support (all p≤.05), controlling for covariates. Psychological and social variables explained more variance in depression and anxiety than physical stressor and communication variables (Δ adjusted R^2=21% and 19% respectively between Models 3 and 5).

Discussion

This study showed that survivors were physically and psychologically well when their PROMIS scores were compared to those in the US general population (mean=50) (Jensen et al., 2017b). Yet, low-acculturated Chinese survivors had a mean physical function score 3-points lower than NHW survivors. According to Jensen et al (2017a), cancer patients with a 3-point lower or higher change in PROMIS physical function scores were also likely to have a functional decline or improvement when assessed by the Eastern Cooperative Oncology Group performance status scale, a scale commonly used by clinicians to determine cancer patients' functional status (Oken et al., 1982). Paradoxically, however, Chinese survivors showed lower levels of depression and anxiety than NHWs. While health-related factors impacted the differences in group outcomes, it is also likely that unmeasured cultural and/or acculturation differences are fundamental to the observed differences.

Specifically, low-acculturated Chinese survivors' diminished physical function was related to their increased treatment-related symptoms and comorbidities, as the functional difference was reduced when these physical problems were taken into account. Although medical communication was significantly associated with physical functioning when entered into the model, its effect was eliminated after the psychosocial variables were entered. This may be a consequence of the significant intercorrelations between communication, perceived control, socioeconomic wellbeing, and social support (see the supplemental table). Previous research has indicated that the impact of communication on health outcomes may be mediated by psychosocial variables (Street et al., 2009). Our own qualitative work suggested that Chinese American survivors' submissive communication style might lead to their unresolved symptoms (Wang et al., 2013b). Optimal communication was found to be positively related to symptom resolution in some minority groups (e.g., Latino survivors; Maly, et al., 2010). Thus, future research should consider mediational pathways among these variables to provide more clarity regarding potential intervention targets to enhance physical functioning in this population.

Our findings confirm that perceived threat, coping style, and social support are salient in explaining survivors' depression and anxiety, regardless of race/ethnicity (Kroenke et al.,

2013; McGinty et al., 2012; Yang, et al., 2008). Yet, Chinese American survivors, especially low-acculturated Chinese experiencing greater psychosocial stress, were less likely to be depressed and anxious than NHW survivors after controlling for covariates. This finding may be partially explained by different cultural values regarding emotional regulation and expression. Chinese collectivist-oriented culture fosters social harmony, thus encouraging regulation of one's emotions to avoid imposing upon others (Bond, 1993). Research showed that this culturally valued form of emotional regulation might have trained low-acculturated Chinese survivors to better manage emotional conflicts between expressing the self and complying with social expectations and norms than high-acculturated Chinese survivors (Tsai & Lu, 2017). This ability to tolerate stressful situations could potentially protect Chinese survivors against depression and anxiety. Alternatively, it is also possible that these cultural values may result in emotional suppression, rather than tolerance of distress. Li et al (2015) indicated that Chinese women tended to suppress their emotions to cope with a breast cancer diagnosis and achieve social harmony; these women had more depressive symptoms than Chinese women without cancer. On the other hand, Chinese culture also fosters a belief that health is a balance between mind and body (Jin & Acharya, 2016). Thus, having positive emotions during difficult times is essential, as a mind preoccupied with thoughts of cancer may induce chronic stress and eventually cause or worsen diseases (Ho, Chan, & Ho, 2004). Finally, there is evidence that Chinese individuals are more likely to report their distress in somatic symptoms (e.g. fatigue or pain) of depression, whereas NHWs are more likely to report psychological symptoms (e.g. feeling worthless) (Leonhart et al., 2016; Parker, Gladstone, & Chee, 2001). Since measures used in this study focused on cognitive-emotional symptoms, these measures may have underestimated depression and anxiety in the Chinese participants. Further research should examine these possibilities.

There are several study limitations. First, this cross-sectional study cannot address causal relationships among the variables of interest. Second, our findings were pertinent to Chinese American breast cancer survivors in California, where culturally appropriate healthcare resources are more accessible. The findings may not be generalized to Chinese immigrants with other cancers or living in different areas, or to other collectivist-oriented immigrants (e.g., Latinos or other Asians). Also, our high-acculturated Chinese sample was small; the results should be interpreted with caution. Third, many of the study sample were diagnosed at stage 0 (30%) and survived for three to five years (41%), probably increasing the overall functional scores reported in this study. Fourth, the study had more Chinese American than NHW survivors with advanced breast cancer stage, perhaps due to fewer Chinese American than NHW breast cancer cases available for enrollment and age-matching procedures. Although cancer stage has been adjusted for in multivariable analysis, future research may consider matching samples by cancer stage. Fifth, a few measures, such as the communication and perceived control surveys, have not been validated in Chinese-speaking samples, and the perceived control and disengagement coping scales had lower reliability in our study samples. Despite the fact that face validity of these measures was qualitatively studied (Wang et al., 2013a 2013b), cautious interpretation of the results is advised. Lastly, the regression models only accounted for approximately 31-33% of the adjusted variance in the study outcomes, suggesting the likelihood of other important unmeasured factors.

Overall, this study suggests that ethnic disparities in physical outcomes can be reduced when clinicians are aware of survivors' current age, their physical symptoms, and limited socioeconomic resources. Educational and behavioral interventions that foster low-acculturated Chinese survivors' symptom management (e.g., increasing access to social resources and support, and communication skills with doctors) may improve their physical functioning. The questions of to what extent do cultural values impact Chinese survivors' emotional reporting, and to enhance culturally competent cancer care, should clinical assessments of depression and anxiety go beyond psychological symptoms, need further investigation.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Sample characteristics of NHW, high-acculturated Chinese, and low-acculturated Chinese breast cancer survivors

Characteristics		NHW (n=216)	High-acculturated Chinese (n=84)	Low-acculturated Chinese (n=136)	P-value	Overall N=436
Age category, n(%)[≠]	21-50 years old	55(25.46)	26(30.95)	39(28.68)	0.54	120 (27.52)
	51-64 years old	106(49.07)	43(51.19)	61(44.85)		210 (48.17)
	65 or older	55(25.46)	15(17.86)	36(26.47)		106 (24.31)
Education, n(%)	>High school	201(93.06)	80(95.24)	70(51.47)	<0.0001	351 (80.50)
Married, n(%)		143(66.51)	54(64.29)	102(75.56)	0.12	299 (68.89)
Employed, n(%)		130(60.47)	58(69.05)	61(44.85)	0.0008	249 (57.24)
Insured, n(%)		216(100.00)	84(100.00)	133(98.52)	0.11	433 (99.54)
Annual income, n(%)[¥]	30k or lower	12(5.74)	4(5.26)	60(51.28)	<0.0001	76 (18.91)
	30,001 −99,999	83(39.71)	34(44.74)	33(28.21)		150 (37.31)
	100k or higher	114(54.55)	38(50.00)	24(20.51)		176 (43.78)
Cancer stage, n(%)	Stage 0-I	176(81.48)	56(66.67)	94(69.12)	<0.01	326 (74.77)
	Stage II-III	40(18.52)	28(33.33)	42(30.88)		110 (25.23)
Time since diagnosis, n(%)	≤36 months	120(55.56)	56(66.67)	82(60.29)	0.20	258 (59.17)
	37-60 months	96(44.44)	28(33.33)	54(39.71)		178 (40.83)
Comorbidity, n(%)	None	62(28.70)	32(38.10)	26(19.12)	<0.001	120 (27.52)
	1 condition	71(32.87)	27(32.14)	33(24.26)		131 (30.05)
	2 or more	83(38.43)	25(29.76)	77(56.62)		185 (42.43)
Number of treatment-related symptoms, n(%)	<5 ≥5	101(46.76) 115(53.24)	33(39.29) 51(60.71)	46(33.82) 90(66.18)	0.05	180 (41.28) 256(58.72)
Had surgery, n(%)[†]		215(99.54)	83(98.81)	133(97.79)	0.33	431 (98.85)
Had chemotherapy, n(%)[‡]		41(20.71)	24(30.38)	35(27.78)	0.16	100 (24.81)
Had radiotherapy, n(%)		106(49.07)	43(51.19)	58(42.65)	0.38	207 (47.48)
Had hormone therapy, n(%)		130(60.19)	55(65.48)	91(66.91)	0.40	276 (63.30)

[≠]Age was survivors' current age at the time of enrollment

[¥]Annual household income had missing values approximately 8%

[†]Fisher exact test was used because of the 50% cells' counts less than 5.

[‡] About 7.6% of the sample's chemo status was unknown.

Table 2.

Unadjusted mean scores of PROMIS outcomes, medical communication, and psychosocial variables

Variables	NHW	High-acculturated Chinese	Low-acculturated Chinese	Cronbach's alpha	
	Mean (SD)	Mean (SD)	Mean (SD)	NHW	Chinese
Physical function (8 items, Range: 20-62)	52.62 (7.97)	54.02 (7.64)	49.39 (8.13)[b,c]	.90	.90
Depression (8 items, range: 37-78)	46.15 (7.86)	45.02 (7.49)	47.50 (9.01)	.90	.91
Anxiety (7 items, range: 36-83)	50.87 (8.47)	48.74 (8.30)	49.10 (9.70)	.92	.91
Medical communication (10 items, range 10-40)	37.32 (4.35)	35.68 (4.65)[a]	32.14 (5.85)[b,c]	.92	.89
Perceived control (4 items, range: 4-20)	12.79 (2.66)	12.47 (2.94)	10.95 (3.60)[b,c]	.68	.66
Perceived severity (6 items, range: 6-30)	17.61 (5.43)	18.50 (5.06)	18.99 (4.73)[b]	.81	.78
Engagement coping[¥] (8 items, range 8-32)	27.01 (3.65)	26.29 (4.27)	23.92 (5.18)[b,c]	.77	.80
Disengagement coping[¥] (6-items, range 6-24)	7.28 (1.73)	7.17 (1.59)	7.84 (2.43)[b,c]	.54	.64
Socioeconomic wellbeing (8 items, range: 8-40)	32.69 (3.78)	31.38 (4.18)	23.81 (6.72)[b,c]	.80	.89
Social support (9 items, range: 9-45)	37.18 (6.86)	35.58 (6.19)	33.27 (7.37)[b,c]	.93	.90
Social network (5 items, rang: 0-35)	13.32 (6.25)	11.95 (6.20)	10.49 (5.93)[b]	≠	≠

Note. Higher mean scores indicate higher physical function, depression, anxiety, communication, perceived severity and control, more engagement and disengagement coping, greater socioeconomic wellbeing, social support, and social network. The total number of people in a patient's social network was calculated; thus, there was no reliability estimated.

[a] Significantly different between high-acculturated Chinese and NHWs, p<.05

[b] Significantly different between low-acculturated Chinse and NHWs, p<.05

[c] Significantly different between low-acculturated and high-acculturated Chinese, p<.05

[¥] A latent factor underlies a subset of coping strategies (see Yang et al., 2008). This two-factor measurement model fit well to the Chinese sample (comparative fit index-CFI=0.94; root mean square residual-RMSEA=0.1), especially for low-acculturated Chinese (CFI=.95 and RMSEA=0.05).

Table 3.

Associations of physical function with physical stressors, medical communication, psychological variables, and social resources variables

Model	**Model 1**		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
Variables	Estimate (SE)	95%CI	Estimate (SE)	95%CI	Estimate (SE)	95%CI	Estimate (SE)	95%CI	Estimate (SE)	95%CI
Constant	57.05 (4.64)	47.93, 66.18***	64.47 (4.50)	55.62, 73.31***	55.66 (6.13)	43.61, 67.71***	62.12 (7.53)	47.32, 76.92***	55.99 (8.03)	40.21, 71.78***
Low-acult. Chinese (vs. NHW)¥	**−3.33 (1.33)**	**−5.95, −0.71****	−1.63 (1.23)	−4.04, 0.78	−0.45 (1.34)	−3.08, 2.18	−0.30 (1.31)	−2.88, 2.27	1.01 (1.44)	−1.82, 3.84
High-acult. Chinese (vs. NHW)	1.94 (1.40)	−0.81, 4.68	1.67 (1.27)	−0.83, 4.17	1.30 (1.30)	−1.24, 3.85	0.86 (1.28)	−1.66, 3.37	1.02 (1.28)	−1.49, 3.54
Age 51-64 (vs. age 21-50)	**−2.59 (1.24)**	**−5.04, −0.15***	−1.65 (1.15)	−3.91, 0.60	−2.15 (1.17)	−4.45, 0.15	**−2.86 (1.16)**	**−5.14, −0.59****	**−2.74 (1.17)**	**−5.04, −0.45***
Age 65+ (vs. age 21-50)	**−3.78 (1.55)**	**−6.82, −0.74***	−2.53 (1.48)	−5.45, 0.39	**−3.90 (1.51)**	**−6.86, −0.93****	**−5.48 (1.55)**	**−8.52, −2.43*****	**−5.37 (1.55)**	**−8.41, −2.32*****
>High School (vs. ≤HS)	0.74 (1.48)	−2.16, 3.65	0.66 (1.34)	−1.98, 3.30	0.81 (1.38)	−1.90, 3.52	0.60 (1.38)	−2.13, 3.32	0.32 (1.41)	−2.45, 3.08
Employed (vs. unemployed)	−1.83 (1.14)	−4.06, 0.41	−1.01 (1.04)	−3.07, 1.04	−0.90 (1.06)	−2.98, 1.18	−0.94 (1.04)	−2.99, 1.10	−0.95 (1.04)	−3.00, 1.10
Cancer stage II-III (vs. stage 0-1)	**−2.75 (1.19)**	**−5.10, −0.40***	−1.63 (1.10)	−3.79, 0.53	−1.63 (1.10)	−3.79, 0.53	−1.02 (1.08)	−3.13, 1.10	−0.82 (1.08)	−2.95, 1.30
37-60 mons since DX (vs. ≤36 mons)	1.69 (1.04)	−0.36, 3.74	1.83 (0.95)	−0.04, 3.70	**1.91 (0.97)**	**−0.00, 3.82***	1.68 (0.95)	−0.20, 3.56	1.83 (0.96)	−0.06, 3.72
1 Comorbidity (vs. 0)			−0.82 (1.28)	−3.34, 1.69	−0.43 (1.31)	−3.00, 2.14	−0.48 (1.28)	−2.99, 2.03	−0.57 (1.29)	−3.10, 1.96
2 Comorbidities (vs. 0)			**−6.80 (1.26)**	**−9.28, −4.33*****	**−5.95 (1.29)**	**−8.48, −3.42*****	**−6.10 (1.26)**	**−8.57, −3.63*****	**−6.00 (1.26)**	**−8.48, −3.52*****
≥5 symptoms (vs. <5)			**−5.23 (1.00)**	**−7.19, −3.26*****	**−5.64 (1.04)**	**−7.68, −3.60*****	**−4.64 (1.03)**	**−6.67, −2.61*****	**−4.48 (1.03)**	**−6.51, −2.44*****
Medical communication					**0.24 (0.10)**	**0.05, 0.43****	0.15 (0.10)	−0.04, 0.35	0.08 (0.11)	−0.13, 0.28
Perceived control							**0.39 (0.18)**	**0.03, 0.74***	0.35 (0.19)	−0.02, 0.71
Perceived severity							**−0.23 (0.10)**	**−0.44, −0.03***	−0.20 (0.11)	−0.41, 0.01

Model	Model 1	Model 2	Model 3	Model 4		Model 5	
Engagement coping				−0.07 (0.12)	−0.31, 0.17	−0.11 (0.13)	−0.36, 0.14
Disengagement coping				−0.32 (0.25)	−0.82, 0.18	−0.21 (0.26)	−0.71, 0.30
Socioeconomic wellbeing						**0.22 (0.11)**	**0.01, 0.43** *
Social support						0.03 (0.08)	−0.12, 0.18
Social network						0.03 (0.08)	−0.13, 0.20
Adjusted McKelvey & Zavoina R2 †	0.09	0.25	0.27	0.30		0.31	

Note. Accul. = acculturation; HS=High school; mons = months; DX=diagnosis. Significant associations were bolded.

¥ Physical function scores in the final model were not significantly different between the low-acculturated and high-acculturated Chinese groups (p=0.72).

† Adjusted by the number of sample size and predictors in each model.

* p≤.05;

** p≤.01;

*** p<.001

Table 4.

Associations of depression with physical stressors, medical communication, psychological, and social resources variables

Model	**Model 1**		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
Variables	Estimate (SE)	95%CI	Estimate (SE)	95%CI	Estimate (SE)	95%CI	Estimate (SE)	95%CI	Estimate (SE)	95%CI
Constant	37.33 (5.08)	27.34, 47.32***	31.94 (5.30)	21.52, 42.36***	49.98 (7.24)	35.75, 64.21***	35.42 (8.12)	19.47, 51.38***	44.92 (8.41)	28.39, 61.45***
Low-accult. Chinese (vs. NHW)¥	1.22 (1.46)	−1.66, 4.09	0.48 (1.45)	−2.37, 3.32	−1.62 (1.57)	−4.71, 1.47	−1.99 (1.40)	−4.75, 0.76	**−3.23(1.50)**	**−6.17,−0.29***
High-accult. Chinese (vs. NHW)	−2.21 (1.53)	−5.22, 0.79	−2.37 (1.50)	−5.32, 0.58	−2.61 (1.54)	−5.64, 0.43	−2.05 (1.38)	−4.75, 0.66	−2.49 (1.34)	−5.12, 0.15
Age 51-64 (vs. age 21-50)	0.25 (1.34)	−2.38, 2.89	0.06 (1.33)	−2.55, 2.67	0.04 (1.36)	−2.63, 2.72	1.94 (1.23)	−0.48, 4.35	1.30 (1.20)	−1.07, 3.66
Age 65+ (vs. age 21-50)	**−4.90(1.71)**	**−8.27,−1.54****	**−4.86(1.76)**	**−8.32,−1.39****	**−3.85(1.79)**	**−7.38,−0.32***	−0.86 (1.68)	−4.16, 2.44	−1.31 (1.63)	−4.52, 1.90
>High school (vs. ≤HS)	0.03 (1.64)	−3.19, 3.24	0.17 (1.60)	−2.98, 3.32	−0.60 (1.64)	−3.83, 2.63	1.68 (1.50)	−1.27, 4.64	1.25 (1.49)	−1.68, 4.17
Employed (vs. unemployed)	1.97 (1.25)	−0.48, 4.42	1.65 (1.23)	−0.77, 4.07	1.07 (1.25)	−1.39, 3.53	0.77 (1.12)	−1.43, 2.97	0.90 (1.10)	−1.25, 3.04
Stage II-III (vs. stage 0-1)	**2.78(1.31)**	**0.22,5.35***	2.05 (1.29)	−0.48, 4.59	2.19 (1.30)	−0.36, 4.74	1.18 (1.15)	−1.08, 3.44	1.03 (1.13)	−1.19, 3.24
37-60 mons since DX (vs. ≤36 mons)	0.64 (1.14)	−1.61, 2.88	0.68 (1.12)	−1.52, 2.88	0.52 (1.15)	−1.74, 2.78	0.73 (1.02)	−1.28, 2.74	0.40 (1.00)	−1.56, 2.36
1 Comorbidity (vs. 0)			−0.73 (1.48)	−3.64, 2.18	−1.05 (1.52)	−4.03, 1.94	−0.66 (1.35)	−3.31, 2.00	−0.13 (1.32)	−2.73, 2.47
2 Comorbidities (vs. 0)			1.88 (1.47)	−1.02, 4.77	1.38 (1.51)	−1.59, 4.36	1.39 (1.34)	−1.24, 4.03	1.32 (1.31)	−1.25, 3.90
≥5 Symptoms (vs. <5)			**3.89(1.71)**	**1.59,6.19****	**3.46(1.22)**	**1.07,5.85****	2.01 (1.10)	−0.16, 4.17	1.81 (1.08)	−0.30, 3.93
Medical communication					**−0.40(0.11)**	**−0.63,−0.18****	−0.09 (0.11)	−0.30, 0.12	0.04 (0.11)	−0.18, 0.25
Perceived control							**−0.55(0.20)**	**−0.94.−0.17****	**−0.43(0.20)**	**−0.82,−0.04***
Perceived severity							**0.55(0.11)**	**0.33,0.77*****	**0.52(0.11)**	**0.30,0.74*****
Engagement coping							**−0.40(0.13)**	**−0.66,−0.14****	−0.24 (0.13)	−0.50, 0.02

Health Psychol. Author manuscript; available in PMC 2020 May 01.

Model	Model 1	Model 2	Model 3	Model 4		Model 5	
Disengagement coping				**1.10(0.27)**	**0.57,1.63** ***	**0.93(0.27)**	**0.40,1.45** **
Socioeconomic wellbeing						−0.11 (0.11)	−0.32, 0.11
Social support						**−0.27(0.08)**	**−0.43,−0.11** **
Social network						−0.15 (0.09)	−0.32, 0.02
Adjusted McKelvey & Zavoina's R2 †	0.06	0.10	0.12	0.29		0.33	

Note. Accul. = acculturation; HS = High school; mons = months; DX=diagnosis; Significant associations were bolded.

¥ Depression scores in the final model were not significantly different between the low-acculturated and high-acculturated Chinese groups (p=0.66).

† Adjusted by the number of sample size and predictors in each model.

* p≤.05;

** p≤.01;

*** p<.001

Table 5.

Associations of anxiety with physical stressors, medical communication, psychological variables, and social resources variables

Model	**Model 1**		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
Variables	Estimate (SE)	95%CI	Estimate (SE)	95%CI	Estimate (SE)	95%CI	Estimate (SE)	95%CI	Estimate (SE)	95%CI
Constant	46.60 (4.48)	37.79, 55.41***	42.37 (4.67)	33.19, 51.55***	54.43 (6.44)	41.77, 67.09***	42.03 (7.27)	27.73, 56.32***	49.29 (7.63)	34.30, 64.28***
Low-accult. Chinese (vs. NHW)¥	−1.85 (1.29)	−4.39, 0.69	−2.43 (1.28)	−4.95, 0.10	**−4.48 (1.40)**	**−7.23,−1.73*** **	**−4.86(1.26)**	**−7.33,−2.39*** **	**−5.80(1.36)**	**−8.47,−3.12*** **
High-accult. Chinese (vs. NHW)	**−3.24 (1.33)**	**−5.86,−0.62***	**−3.40 (1.31)**	**−5.98,−0.82** **	**−3.89 (1.35)**	**−6.54,−1.24*** **	**−3.40(1.22)**	**−5.80,−1.00** **	**−3.65(1.21)**	**−6.03,−1.28** **
Age 51-64 (vs. age 21-50)	−1.29 (1.18)	−3.62, 1.04	−1.30 (1.18)	−3.61, 1.01	−1.35 (1.20)	−3.72, 1.01	0.47 (1.1)	−1.70, 2.62	−0.02 (1.09)	−2.16, 2.13
Age 65+ (vs. age 21-50)	**−5.87(1.50)**	**−8.81,−2.93*** **	**−5.43 (1.55)**	**−8.47,−2.39*** **	**−4.55 (1.58)**	**−7.64,−1.45*** **	−1.37 (1.49)	−4.29, 1.56	−1.80 (1.47)	−4.69, 1.09
>High school (vs. ≤HS)	2.00 (1.45)	−0.85, 4.85	2.12 (1.42)	−0.67, 4.92	1.89 (1.47)	−0.99, 4.77	**3.50(1.35)**	**0.84,6.16** **	**3.39(1.36)**	**0.72,6.06** **
Employed (vs. unemployed)	0.92 (1.10)	−1.23, 3.08	0.81 (1.09)	−1.32, 2.94	0.15 (1.10)	−2.03, 2.32	−0.12 (1.00)	−2.08, 1.84	0.03 (0.99)	−1.91, 1.97
stage II-III (vs.stage 0-I)	1.96 (1.16)	−0.31, 4.24	1.31 (1.15)	−0.94, 3.57	1.40 (1.15)	−0.87, 3.67	0.61 (1.04)	−1.43, 2.66	0.36 (1.03)	−1.67, 2.38
37-60 Months since DX (vs. ≤36 mons)	−0.71 (1.00)	−2.68, 1.27	−0.65 (0.99)	−2.59, 1.29	−0.78 (1.01)	−2.78, 1.21	−0.43 (0.91)	−2.22, 1.37	−0.70 (0.90)	−2.48, 1.08
1 Comorbidity (vs. 0)			−1.97 (1.30)	−4.52, 0.59	−1.82 (1.33)	−4.44, 0.81	−1.51 (1.20)	−3.86, 0.85	−1.04 (1.20)	−3.39, 1.30
2 Comorbidities (vs. 0)			0.49 (1.30)	−2.06, 3.04	0.02 (1.33)	−2.60, 2.64	0.21 (1.19)	−2.14, 2.56	0.28 (1.18)	−2.05, 2.60
≥5 Symptoms (vs. <5)			**3.36 (1.03)**	**1.33,5.39*** **	**3.15(1.07)**	**1.04,5.26*** **	1.54 (0.98)	−0.39, 3.47	1.38 (0.97)	−0.54, 3.29
Medical communication					**−0.27 (0.10)**	**−0.47,−0.07** **	−0.01 (0.10)	−0.20, 0.18	0.09 (0.10)	−0.11, 0.29
Perceived control							**−0.50(0.18)**	**−0.84,−0.15** **	**−0.47(0.18)**	**−0.82,−0.12** **
Perceived severity							**0.60(0.10)**	**0.40,0.80*** **	**0.56(0.10)**	**0.36,0.76*** **
Engagement coping							**−0.30(0.12)**	**−0.53,−0.07** **	−0.18 (0.12)	−0.42, 0.05

Model	Model 1	Model 2	Model 3	Model 4		Model 5	
Disengagement coping				**0.62(0.24)**	**0.14,1.10** **	**0.47(0.25)**	**−0.00,0.96** *
Socioeconomic wellbeing						−0.09 (0.10)	−0.29, 0.11
Social support						**−0.19(0.07)**	**−3.33,−0.04** **
Social network						−0.08 (0.08)	−0.23, 0.08
Adjusted McKelvey & Zavoina's R2 †	0.07	0.11	0.12	0.29		0.31	

Note. Accul. = acculturation; HS=High school; mons = months; DX=diagnosis. Bold numbers indicate significant associations.

¥ Anxiety scores in the final model were not significantly different between the low-acculturated and high-acculturated Chinese groups (p=0.48).

† Adjusted by the number of sample size and predictors in each model.

* p≤.05;

** p≤.01;

*** p<.001