

Why spouses depress each other: A cross-national study to test the shared resource hypothesis in depressive symptom concordance within older adult couples

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Abstract

The shared resource hypothesis suggests that married couples share the same environmental resources, which shape their health concordance. This study tests its cross-national applicability. Cross-sectional 2012–2013 Health and Retirement Study data from China, England, Mexico, and the United States were analyzed. Heterosexual couples (age ≥ 60) who were married or partnered were studied ($N = 20,565$ pairs). Dyadic data were analyzed by multilevel models to examine the effect of self and spousal social and physical health statuses on depressive symptoms. Regression models were used to test the relationship between couples' shared resources and depressive symptom concordance. Results indicated both husbands and wives' depressive symptoms were associated with their own and spouses' social and health statuses. Most couple-level resources were insignificant predictors for Chinese and Mexican couples' concordance, but having more social and financial resources was associated with higher concordance among British and American couples. Self-reported health was the most consistent predictor in all countries. The shared resource hypothesis was more applicable to depressive symptom concordance within couples in the United States and England, but not in China and Mexico. Couple-centered intervention is suggested for clinical practice, and the spousal effect should be considered in policymaking.

KEYWORDS

actor–partner interdependence model, cross-national study, depressive symptoms, health concordance, shared resource hypothesis

1 | INTRODUCTION

Health concordance is commonly found within couples who are legally married or long-term partnered. Health concordance is generally defined as similarity or strong correlation between the couples' health status (Meyler, Stimpson, & Peek, 2007). Studies have suggested that spouses resemble each other in physical health (Stimpson, Peek, & Markides, 2006; Wang et al., 2017), mental health (Ruthig, Trisko, & Stewart, 2012), health behavior (Lee et al., 2018), and medical utilization (Kendler, Lönn, Salvatore, Sundquist, & Sundquist, 2018). A majority of these studies concerning health concordance utilized empirical evidence from surveys targeting older adults. For older adults, mental health concordance in depression was stronger than in anxiety or cognition (Dufouil & Alperovitch, 2000; Meyler et al., 2007). However, most studies about depression concordance within older adult couples were conducted in Western countries; few have concerned non-Western countries or were conducted as cross-national comparisons.

Despite consistent findings of depression concordance among older adult couples, there has been disagreement about its theoretical explanation. Three theories have been used frequently to explain spousal health concordance. Two of these, assortative mating and affective contagion, have been widely tested and supported, while the shared resource hypothesis remains controversial due to inconsistent measures in different studies (e.g., Butterworth & Rodgers, 2006; Jurj et al., 2006; Meyler et al., 2007; Nordsletten et al., 2016). In addition, most existing studies were not theory-driven (Meyler et al., 2007). To address these research gaps and shortcomings, this study uses harmonized data from the international family surveys of the Health and Retirement Study (HRS) for China, the United States, Mexico, and England, to test the shared resource hypothesis and explore its cross-national applicability in four countries using consistent measures.

1.1 | Theories of health concordance

Currently, there are three major theories explaining couples' health concordance. *Assortative mating theory* suggests spouses have initial similarities prior to their marriage. Selectivity or preference in the mating process results in people tending to choose life partners who are similar to them in socioeconomic status or health conditions (Meyler et al., 2007). Consequently, the health behavior or condition of one partner prior to marriage influenced the other partner's health trajectory (Di Castelnuovo, Quacquarello, Donati, De Gaetano, & Iacoviello, 2008; Homish & Leonard, 2008). The assortative mating hypothesis has been widely supported in studies about physical health, health behavior, and psychiatric disorders (e.g., Nordsletten et al., 2016; Treur, Vink, Boomsma, & Middelkamp, 2015). *Affective contagion theory*, also called mood convergence or affective infection, suggests the affective states between couples are mutually contagious, meaning the emotional symptomatology of one spouse can substantially infect the other (Ruthig et al., 2012). Marital satisfaction and relationship closeness were keys to couples' mental health and sleep convergence (Kiecolt-Glaser & Wilson, 2017). Affective contagion theory also has been widely tested and supported regarding mental health concordance (e.g., Meyler et al., 2007; Stimpson, Masel, Rudkin, & Peek, 2006).

The *Shared Resource Hypothesis* focuses on the impact of interactive environmental and marital arrangements on couples. Contrasted with affective contagion theory, the shared resource hypothesis explores health concordance from the societal and economic perspective rather than from the viewpoint of emotional resonance. Married couples share the same environments and resources, which could translate into shared health risks or advantages that could either harm or benefit the couples' health (Meyler et al., 2007). It is believed that the benefits of marriage include improving the spouses' health, longevity, and income. The beneficial impact was achieved by making long-term commitments, sharing social resources, and expanding economic and social networks (Ross, Mirowsky, & Goldstein, 1990; Waite, 1995). The health benefits would dissipate with divorce and the termination of shared environments and loss of mutual support (Smith & Zick, 1994).

However, unlike the assortative mating and affective contagion theories, research findings were inconsistent when testing the applicability of the shared resource hypothesis. Some studies argue that there is insufficient evidence to support the hypothesis. For example, Butterworth and Rodgers (2006) found that most personal-, couple-, and area-level risk factors could not explain spousal mental health concordance among Australian couples. Another Australian study also implied the insufficiency of spousal interaction to explain spousal health behavior (Grant et al., 2007). Modest explanatory power of shared resources or environment was also found in the United States (Ferrer, Palmer, & Burge, 2005) and the Netherlands (Monden, 2007). In contrast, evidence from some other studies strongly supports the shared resource hypothesis. For example, studies about older American married couples found that individual-level and couple-level characteristics were significant predictors of depressive symptoms and health status (Townsend, Miller, & Guo, 2001; Wilson, 2002). A study of Chinese couples living in Shanghai also supported the shared resource hypothesis through shared health habits and risks (Jurj et al., 2006).

Several reasons could explain these inconsistent findings of applicability of the shared resource hypothesis. First, these studies addressed various aspects of health concordance among different age groups (e.g., Ferrer et al., 2005; Townsend et al., 2001). Second, some studies did not use nationwide representative samples, making it difficult to generalize findings (e.g., Jurj et al., 2006). Third, they focused on only one country and used different measures, reducing the comparability between countries (Meyler et al., 2007). Therefore, these studies were unable to consider cross-national variations in social contexts. This study focuses on older adult couples and cross-national comparisons using representative samples and consistent measures.

1.2 | Cross-national study in health concordance

Existing studies have found health concordance, either for good or ill, among couples in many countries, including the United States (e.g., Kiecolt-Glaser & Wilson, 2017), Europe (Huijts, Monden, & Kraaykamp, 2009), and China (Jurj et al., 2006), among others. Overwhelming evidence has illustrated depression concordance within couples (Meyler et al., 2007). However, Walker and Luszcz (2009) found that many of the health concordance studies on older adult couples focused on Caucasians in the United States and called for more studies on couples with diverse racial and cultural backgrounds. In addition, many studies have been conducted within a single-country context without a comparative cross-national perspective. Comparative research, especially cross-national comparison, could provide implications for policymaking and clinical practice by contrasting experiences with other places. In the context of population aging as a common phenomenon across the globe, comparing aging experiences from different countries could be informative in gerontological research (Jackson, 2002).

However, few studies have focused on cross-national comparisons. For example, Roberts, Banse, Ebbeler, and Ferketich (2017) found spousal concordance in the use of alternative tobacco products, with US couples having the highest concordance compared to their counterparts in Austria, Greece, Israel, the Netherlands, and Slovakia. Therefore, it can be inferred from previous studies that there are cross-national variations in the level of health concordance within older adult couples (e.g., Roberts et al., 2017). Machado et al. (2017) found spousal concordance in drinking and smoking habits in Latin American couples but did not discuss cross-national comparisons. These studies also did not consider concordance in mental health, so in-depth cross-national comparison about spousal mental health concordance is warranted. To expand our understanding of the health concordance study in different country settings, this study provides a cross-national perspective on depressive symptom concordance and explores differences in the applicability of the shared resource hypothesis. Following the case selection strategy in comparative research (Lijphart, 1975), we chose four countries—China, the United States, Mexico, and England—primarily based on their different levels of economic development and their distinct geographical-cultural features. For example, China and the United States are dissimilar both in economic characteristics and in geographical locations. The assumption is that developing and developed countries differ substantially in overall resource availability, which could shape their populations' mental health condition contextually via family resource adequacy.

1.3 | Research objectives and hypotheses

As indicated in the literature review, depression concordance is most consistent and robust among older adult couples (Meyler et al., 2007). However, there is currently no conclusive explanation about why depression concordance is stronger than other aspects of psychological health. Dufouil and Alperovitch (2000) suggested one possible reason was that shared life events had stronger influences on the older couples' depression than on other psychological traits. In addition, there are still unsettled arguments about the applicability of the shared resource hypothesis, so this study endeavors to fill the research gap by testing whether the shared resource hypothesis can explain spousal depression concordance. Previous studies also illustrated the need to give more attention to non-Western countries and to cross-national comparisons (Meyler et al., 2007; Walker & Luszcz, 2009), so this study further explores cross-national applicability of the shared resource hypothesis in different country contexts. By learning if the shared resource hypothesis could explain concordance in older adult couples' depressive symptoms, this study aims to draw some implications for mental health policy design. It also aims to develop some recommendations for clinical practices about how to improve older adults' mental well-being via couple-level intervention. This study addresses three specific research hypotheses.

H1: Older people's depressive symptoms are related to both their own and their spouse's social and physical health statuses. The assumption of health concordance that the couple's health status affects and resembles each other has been supported by previous studies (e.g., Stimpson, Masel, et al., 2006; Townsend et al., 2001). The joint effect of living together and sharing similar social network and resources also bolsters the couple's mental health similarity. The shared resource hypothesis emphasized the communal interaction between the couple who depends on each other. This is equivalent to the actor-partner interdependence model (APIM) in marriage research by exploring the effect of actor and partner simultaneously in the same model (Kenny, Kashy, & Cook, 2006). The APIM is a widely used statistical model to test the interdependent relationship between actors and partners in dyadic data (Cook & Kenny, 2005). It is assumed that there is interdependence between two individuals when exploring their interpersonal relationship. The emotion or behavior of one person (actor) could affect that of another person (partner). APIM has been applied to sleep concordance research (Hasler & Troxel, 2010). It is applicable to the current study considering we explore the depressive symptom concordance within the interdependent couple. In other words, the individual's mental health is affected by his/her own resources and by his/her partner's resources.

H2: Having more resources is associated with a higher level of depressive symptom concordance. The shared resource hypothesis emphasizes the mutual benefits of marriage. In the marital arrangement, couples can share financial assets and social networks and enjoy mutual support from each other. Logically, having more resources, for example, financial, social, or health-related aspects, should enhance benefits to emotional connectedness between couples, thereby strengthening depressive symptom concordance.

H3: There are cross-national variations in the applicability of the shared resource hypothesis. Contextual backgrounds should not be ignored when addressing older adult couples' health concordance (Walker & Luszcz, 2009). Couples and their marriage are embedded in the sociopolitical contexts they live in and therefore are affected by them. Considering national differences in social resources between countries, especially between developing and developed countries, this study is predicated on the premise that cross-national variations are important in applying the shared resource hypothesis to explain patterns of depressive symptom concordance within couples.

2 | METHODS

2.1 | Data source

This study used data from the international family surveys of HRS harmonized by the Program on Global Aging, Health, and Policy at the University of Southern California (www.g2aging.org). The program, also called Gateway to Global Aging Data, unifies the coding of HRS-series

studies to provide researchers with handy data and facilitate cross-national studies. Two developed countries/regions (the United States and England) and two developing countries (China and Mexico) located in different continents were chosen. Harmonized data were retrieved from RAND HRS for the United States, the China Health and Retirement Longitudinal Study (CHARLS), the Mexican Health and Aging Study (MHAS), and the English Longitudinal Study on Ageing (ELSA). Cross-sectional 2012–2013 data were the latest version available when the data were retrieved for analysis. Respondents and their spouses/partners responded to the same questionnaire. This study focuses on heterosexual older couples, so only couples who were legally married or long-term partnered, heterosexual, and both individuals who were aged at least 60 years were included in the analyses, resulting in 4,347 Chinese couples, 7,026 American couples, 4,848 Mexican couples, and 4,344 British couples.

2.2 | Measures

This study used both individual- and couple-level measures. Couple-level measures are recoded or transformed by combining the information from both individuals within the couple. Currently, there were no well-established scales or indicators to measure resources within the couples. Thus, we retrieved all available variables in the HRS-family questionnaires that might help measure the financial and social aspects of resources based on their face validity and relevance in previous studies.

2.2.1 | Outcome variable

The scale of the Center for Epidemiologic Studies Depression (CESD) was used to measure older adults' depressive symptoms in the HRS-series studies. The numbers of items in the CESD were different in the four harmonized datasets (eight items in HRS, nine items in MHAS, eight items in ELSA, and ten items in CHARLS), so average scores were used to make results comparable similar to previous cross-national studies using HRS-series data (e.g., Díaz-Venegas, Reistetter, & Wong, 2016).¹ We further rescaled the CESD scores by the least common multiple (i.e., 360) of the number of items in the four datasets. Rescaling the dependent variable would not change the major findings of model results but helped facilitate the interpretation of coefficients in the multilevel and regression analyses. Thus, in the individual-level measure, the range of CESD was 0–360; a higher score implies greater severity of depressive symptoms.

To measure health concordance at the couple level, we calculated the depressive symptom difference by subtracting the couple's scores from each other. We further used the absolute values of CESD score differences to measure the extent of dissimilarity of depressive symptoms between the members of the couple. The negative sign of within-couple difference values is not relevant for the analysis because gender difference is not this study's focus and it could introduce inaccurate estimation into the model if data with different directionality were used. In this case, a lower absolute value of the difference indicated a smaller difference, that is, higher depressive symptom concordance within couples.

2.2.2 | Predictor variables

Demographic information

Gender, age, and education were included as demographic variables.² Gender had two levels as we included only heterosexual couples in this study. Age is a continuous variable. At the couple level, we took the average of the couples' ages. It is hypothesized that the higher the average age of the couple, their depressive symptom concordance is more likely to be higher assuming the older couples have spent a longer time being married and living together. Education was categorized by 2 and 3 years of college and above as "higher education" and other responses as "lower education." Thus, education had two levels in the individual-level measure. In the couple level, we created a new count variable by calculating the number of members among the couples having higher education. The range was 0–2, with 0 = neither of the members of the couple were highly educated, 1 = only one among the couple was highly educated, and 2 = both members of the couple were highly educated.

Employment, pensions, and insurance coverage

Employment, pensions, and health insurance were considered as financial resources in this study because of their close association with older adults' income. At the individual level, employment status had two categories: currently working for pay and not working. We

¹We considered using the same five numbers of items of CESD to measure the depressive symptoms across four countries. However, discarding the unshared items across four countries' datasets eliminated information and reduced the reliability of the CESD scale. It also made the model results less stable.

²Other common demographic variables such as race and occupation were not available across all four datasets and thus were not included in this study. We also considered including marital satisfaction and relationship characteristics as covariates (e.g., Kiecolt-Glaser & Wilson, 2017), but no such variables were available across the datasets for all four countries.

calculated the number of people currently working for pay among the couple, with values ranging from 0 (none were working) to 2 (both were working). For the pension and health insurance measures, the HRS-series studies asked respondents and spouses whether they received public and private pensions and health insurance, separately.³ The amount of pension income was incomparable across the four countries. Thus, at the individual level, the sources of pensions/health insurances had three values, with 0 (no public or private pensions/insurance), 1 (have public or private pension/insurance), and 2 (have both public and private pensions/insurance). At the couple level, the number of pension/health insurance sources for the couple ranged from 0 (the couple had no pensions/insurance) to 4 (both members of the couple have both public and private pensions/insurance).

Family network and income

Many measures related to social support are not available across all four countries' datasets; therefore, the number of living children is used as a simplified indicator of social network. The second indicator is household income, measured at the couple or household level. Household income was further transformed into purchasing power based on U.S. dollars to make the metric comparable across all four countries. Finally, we recoded household income into a categorical variable with five levels: \$<5,000; \$5,000–7,000; \$7,001–10,000; \$10,001–20,000; and \$>20,000. Number of living children and household income were couple-level measures and thus were the same for both couple members in dyadic data.

Health covariate

Physical health is an important covariate in predicting older adults' depression (Fiske, Wetherell, & Gatz, 2009). In studying health concordance, spouses' physical health was also a significant risk factor for respondents' depression (Siegel, Bradley, Gallo, & Kasl, 2004). Therefore, we included self-reported health as a simplified indicator of physical health. A 5-point Likert range was used with values from 0 = excellent to 5 = poor. At the couple level, we took the average scores of each person's self-reported health.

2.3 | Analytic strategy

First, descriptive analyses were conducted for the older adults in four countries. In particular, the Pearson correlation significance tests were conducted to examine the linear relationship between the couple's CESD score as previous health concordance studies did (e.g., Dufouil & Alperovitch, 2000; Hasler & Troxel, 2010). Second, the data have a dyadic structure with two individuals nested within the same couple. Thus, multilevel model estimation was employed to address the interdependence of dyadic data. Referring to the APIM (Kenny et al., 2006), we regressed the husband's CESD score on both his own and the wife's social, financial, and physical health predictors using a multilevel approach to test Hypothesis 1. Similar multilevel analysis has been applied in previous studies (e.g., Stimpson, Masel, et al., 2006; Townsend et al., 2001). We did not include the wife's CESD score as a predictor because of potential endogeneity bias. A similar model was estimated for the wife's CESD score regressed on her own and the husband's demographic, financial, and physical health predictors. In such cases, we would be able to compare gender difference in the relationships. The multilevel equations for husband's CESD are as follows.

Level 1:

$$\begin{aligned} \text{HusbandCESD}_{ij} = & \beta_{0j} + \beta_{1j}\text{HusbandAge}_{1ij} + \beta_{2j}\text{WifeAge}_{2ij} + \beta_{3j}\text{HusbandEdu}_{3ij} + \\ & \beta_{4j}\text{WifeEdu}_{4ij} + \beta_{5j}\text{HusbandWork}_{5ij} + \beta_{6j}\text{WifeWork}_{6ij} + \beta_{7j}\text{HusbandPension}_{7ij} + \\ & \beta_{8j}\text{WifePension}_{8ij} + \beta_{9j}\text{HusbandInsurance}_{9ij} + \beta_{10j}\text{WifeInsurance}_{10ij} + \\ & \beta_{11j}\text{HusbandPhysicalhealth}_{11ij} + \beta_{12j}\text{WifePhysicalhealth}_{12ij} + r_{ij}. \end{aligned} \quad (1)$$

Level 2:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\text{NChildren}_{1j} + \gamma_{02}\text{HouseholdIncome}_{2j} + \mu_{0j}, \quad (2)$$

where the outcome variable is the CESD score of the i th husband nested within the j th dyad, β_{aj} refers to the coefficients of individual-level predictors, and γ_{01} and γ_{02} represent the coefficients of couple-level measures. All errors terms are assumed to be independently and normally distributed with mean 0 and constant variance.

Third, to further test the association of shared resources with depressive symptom concordance proposed by hypotheses 2 and 3, we fit a model in which the CESD difference score is regressed on all couple-level predictors. Using an absolute value of difference score could mask the original size of the couples' CESD scores. We considered adding the average score of CESD as covariate, but it would generate the multicollinearity problem in the model because CESD was significantly correlated with self-reported physical health (correlation coefficient >0.400, $p < 0.001$). Thus, having the average score of self-reported health as independent variable could provide similar information about the original CESD score of the couple. Preliminary analysis showed that using ordinary least square estimation violated the normality

³Other kinds of pension or social security plan or government transfer were not considered in this study, as these other options varied across countries.

TABLE 1 Descriptive statistics of husbands and wives in four countries

	China		United States		Mexico		England	
	Husbands	Wives	Husbands	Wives	Husbands	Wives	Husbands	Wives
Sample size (N)	4,347	4,347	7,026	7,026	4,848	4,848	4,344	4,344
Age	68 (1.08)	65 (1.08)	73 (0.24)	70 (0.46)	70 (0.68)	67 (0.96)	70 (0.49)	68 (0.67)
Median (Skewness)								
education—higher	134 (3.08)	38 (0.87)	3,450 (49.24)	3,214 (45.87)	974 (20.32)	831 (17.23)	783 (31.51)	429 (21.53)
N (%)								
Working status—yes	2,393 (55.72)	2,183 (50.96)	1,891 (27.37)	1,615 (23.37)	1,848 (38.13)	578 (11.93)	987 (22.72)	750 (17.28)
N (%)								
physical health	3.90 (0.89)	4.01 (0.89)	2.88 (1.08)	2.78 (1.05)	3.70 (0.86)	3.85 (0.77)	2.85 (1.08)	2.75 (1.07)
Mean (SD)								
Number of pensions	1 (−0.69)	1 (−1.34)	1 (0.03)	1 (0.09)	0 (0.62)	0 (3.09)	2 (−0.8)	1 (−0.31)
Median (Skewness)								
Number of health insurances	1 (−3.63)	1 (−3.93)	1 (0.16)	1 (−0.05)	1 (−1.62)	1 (−1.93)	1 (2.38)	1 (2.42)
Median (Skewness)								
CESD score	72 (0.83)	108 (0.44)	0 (2.20)	0 (1.81)	80 (0.77)	120 (0.37)	0 (2.26)	45 (1.80)
Median (Skewness)								
Number of living children	3 (0.61)		3 (1.50)		5 (0.61)		2 (1.31)	
Median (Skewness)								
Household income ^a								
\$<5,000	1,762 (56.37)		61 (0.87)		3,182 (65.64)		28 (0.65)	
\$5,000–7,000	232 (7.42)		39 (0.56)		318 (6.56)		4 (0.09)	
\$7,001–10,000	279 (8.93)		74 (1.05)		306 (6.31)		24 (0.56)	
\$10,001–20,000	583 (18.65)		592 (8.43)		490 (10.11)		429 (9.92)	
\$>20,000	270 (8.64)		6,260 (89.10)		552 (11.39)		3,839 (88.78)	

Note: When the distribution of a continuous variable was skewed, we used median and skewness to describe.

^aHousehold income has been transformed into purchasing power in units of US dollars.

TABLE 2 Multilevel model results testing actor–partner interdependence model

	China		United States		Mexico		England	
	Wife	Husband	Wife	Husband	Wife	Husband	Wife	Husband
Fixed effect								
Intercept	16.68 (21.19)	16.68 (21.19)	7.22 (11.07)	7.22 (11.07)	−96.65*** (15.89)	−96.65*** (15.89)	−14.05 (22.06)	−14.05 (22.06)
Wife's age	−1.90*** (0.25)	1.01*** (0.25)	−0.87*** (0.13)	0.41** (0.13)	−0.79*** (0.19)	0.99*** (0.19)	−1.29*** (0.26)	1.47*** (0.26)
Husband's age	1.01*** (0.25)	−1.90*** (0.25)	0.41** (0.13)	−0.87*** (0.13)	0.99*** (0.19)	−0.79*** (0.19)	1.47*** (0.26)	−1.29*** (0.26)
Wife's education—higher	−14.09 (7.82)	1.87 (7.69)	−3.22* (1.38)	1.11 (1.38)	4.84 (2.67)	5.98* (2.66)	−1.69 (2.49)	−3.75 (2.50)
Husband's education—higher	1.87 (7.69)	−14.09 (7.82)	1.11 (1.38)	−3.22* (1.38)	5.98* (2.66)	4.84 (2.67)	−3.75 (2.50)	−1.69 (2.49)
Wife's working—yes	−5.92* (2.44)	7.96** (2.44)	−12.22*** (1.58)	2.12 (1.59)	−15.38*** (2.47)	3.68 (2.47)	−13.07*** (3.06)	10.20*** (3.06)
Husband's working—yes	7.96** (2.44)	−5.92* (2.44)	2.12 (1.59)	−12.22*** (1.58)	3.68 (2.47)	−15.38*** (2.47)	10.20*** (3.06)	−13.07*** (3.06)
Number of wife's pension	−4.50 (2.96)	0.22 (2.99)	−3.83** (1.29)	1.15 (1.28)	−25.94*** (2.71)	−1.86 (2.71)	−8.71*** (1.92)	4.33* (1.92)
Number of husband's pensions	0.22 (2.99)	−4.50 (2.96)	1.15 (1.28)	−3.83** (1.29)	−1.86 (2.71)	−25.94*** (2.71)	4.33* (1.92)	−8.71*** (1.92)
Number of wife's health insurance	4.05 (6.04)	2.32 (5.89)	−1.54 (1.50)	−1.41 (1.50)	9.81** (3.81)	−10.92** (3.81)	−1.94 (6.32)	−1.75 (6.31)
Number of husband's health insurance	2.32 (5.89)	4.05 (6.04)	−1.41 (1.50)	−1.54 (1.50)	−10.92** (3.81)	9.81** (3.81)	−1.75 (6.31)	−1.94 (6.32)
Wife's self-reported health	29.34*** (1.20)	10.13*** (1.21)	28.52*** (0.63)	6.59*** (0.62)	49.99*** (1.27)	7.53*** (1.27)	20.13*** (1.21)	3.26** (1.20)
Husband's self-reported health	10.13*** (1.21)	29.34*** (1.20)	6.59*** (0.62)	28.52*** (0.63)	7.53*** (1.27)	49.99*** (1.27)	3.26** (1.20)	20.13*** (1.21)
Number of living children	2.53** (0.88)	2.53** (0.88)	−0.06 (0.32)	−0.06 (0.32)	1.24** (0.40)	1.24** (0.40)	−0.73 (0.88)	−0.73 (0.88)
Household income								
5,001–7,000	−3.28 (4.72)	−3.28 (4.72)	4.84 (12.20)	4.84 (12.20)	−0.66 (4.47)	−0.66 (4.47)	−48.40 (35.85)	−48.40 (35.85)
7,001–10,000	−16.01*** (4.34)	−16.01*** (4.34)	−6.93 (10.17)	−6.93 (10.17)	2.79 (4.80)	2.79 (4.80)	−15.81 (35.79)	−15.81 (35.79)
10,001–20,000	−15.00*** (3.40)	−15.00*** (3.40)	−3.99 (8.19)	−3.99 (8.19)	−5.06 (3.94)	−5.06 (3.94)	−23.27 (17.15)	−23.27 (17.15)
≥20,001	−21.16*** (4.76)	−21.16*** (4.76)	−13.77 (7.97)	−13.77 (7.97)	−10.36* (3.87)	−10.36* (3.87)	−5.81 (16.21)	−5.81 (16.21)
Random effect								
Dyad (intercept)	1,781	1,781	451	451	1,551	1,551	639.6	639.6
Residuals	4,517	4,517	4,195	4,195	6,731	6,731	2,800.4	2,800.4

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

assumption. Thus, we considered the CESD difference score as count data. However, the distribution of CESD difference scores was over-dispersed and/or zero-inflated, so we fit negative binomial and zero-inflated models for each of the four countries' data separately. Model-fitting metrics such as the Wald Chi-square test, the Akaike information criterion, and log likelihood were compiled. Finally, as there was no household-level weight in the British dataset, all analyses were unweighted. Analyses were conducted in R using the packages "psych," "lme4," "optimx," "car," "MASS," and "pscl."

3 | RESULTS

3.1 | Descriptive characteristics

Table 1 shows the descriptive analysis of older couples in four countries. The median age of husbands was higher than wives' in four countries. The majority of Chinese older adults did not have higher education and were currently working for pay. A similar situation was found among Mexican older respondents that most of them did not have higher education. Most Mexican older adults did not have pensions but had more than five children. For the United States and England, many older adults had higher education and fewer than 30% were currently working for pay. In addition, there were significant differences between the four countries, with American and British couples having much higher income and more likely to be highly educated than their Chinese and Mexican counterparts ($p < 0.05$). Regarding health measures, the couples in the United States and England also had better performance in their self-reported physical health and CESD scores than those in China and Mexico.

Depressive symptoms score differences between the couples ranged from 0 to 360. Paired t test results showed the difference between the couples' CESD scores was statistically insignificant ($p = 0.31$ for China; $p = 0.98$ for United States; and $p > 0.99$ for Mexico and England), indicating no difference between the couples' depressive symptoms. Furthermore, all pairwise correlations between the couples' CESD scores were statistically significant ($p < 0.001$). The correlations were 0.32 for Chinese couples, 0.17 for American couples, 0.22 for Mexican couples, and 0.24 for British couples.

3.2 | Multilevel model results

Table 2 shows the multilevel model results testing APIM for the husband and wife in the four countries, separately. The intraclass correlation coefficient was highest in China's model (0.29), followed by the Mexico and England models (0.18), and lowest in the U.S. model (0.09). The coefficients of the self and spouse predictors were exactly the same in both husbands' and wives' models. For all four countries, self and spouse age and physical health were consistently significant predictors. In particular, better self-reported health was associated with the self and spouse reporting less depressive symptoms. Physical health had the largest coefficient size compared to other predictors. Number of living children and household income were significant only for the China and Mexico models. That is, having fewer children but more household income was associated with less depressive symptoms for both husband and wife living in China and Mexico.

In the China models, both of the couples' working statuses were significant predictors. Looking at the simple effect, husband's working status was associated with more depressive symptoms for both him and his wife, while the wife's working status was associated with less depressive symptoms for both her and her husband's symptoms. In the US models, only self-education, working status, and pension status significantly predicted self CESD score. There was no spousal effect of social and financial status on American couples' depressive symptoms. In the Mexico models, spouse having lower education, self working for pay, self having more types of pensions, and self having fewer sources of health insurance, but spouse having more sources of health insurance were associated with self lower depressive symptoms. In the England models, self working for pay but spouse not working for pay, and self having more types of pensions while spouse having fewer sources of pensions were associated with self lower depressive symptoms.

3.3 | Regression results with count data

The zero-inflation and over-dispersion issues in the depressive symptom concordance measure led to using different models in the four countries as indicated from Table 3. General model-fitting statistics indicated all models were reasonable. The regression model results again illustrated the strong association between physical health and depressive symptom concordance across all countries ($OR > 1$, $p < 0.001$). That is, the better average physical health the couple reported, the stronger the concordance of their depressive symptoms.

Most other coefficients were insignificant in the models for China and Mexico. For the U.S. model, having more people working for pay and more sources of health insurance were associated with higher depressive symptom concordance ($OR < 1$, $p < 0.05$). For the England model, having more household income, more people having higher education, fewer people working for pay, and fewer sources of pension, but more sources of health insurance were associated with higher depressive symptom concordance (Table 3).

TABLE 3 Regression results of the effects of shared resources on couples' depression concordance

Model	China Zero-inflated negative binomial model	United States Zero-inflated negative binomial model	Mexico Negative binomial model	England Zero-inflated Poisson model
Intercept	83.17*** (0.23)	103.22*** (0.17)	57.69*** (0.28)	101.49*** (0.06)
Average age between couples	1.00 (0.00)	0.99*** (0.00)	1.00 (0.00)	1.00*** (0.00)
Average self-rated health between couples	1.10*** (0.02)	1.27*** (0.01)	1.20*** (0.03)	1.26*** (0.01)
Number of living children	1.01 (0.01)	1.01 (0.00)	1.01* (0.01)	0.95*** (0.00)
Household income				
5,001–7,000	1.09 (0.05)	0.77 (0.21)	1.05 (0.08)	0.00 (91.83)
7,001–10,000	0.90* (0.05)	0.77 (0.15)	1.11 (0.09)	0.24*** (0.11)
10,001–20,000	1.00 (0.04)	0.92 (0.12)	1.08 (0.07)	0.64*** (0.04)
≥20,001	0.94 (0.05)	0.91 (0.12)	0.91 (0.07)	0.64*** (0.04)
Education attainment of couples	1.10 (0.06)	1.01 (0.01)	0.97 (1.04)	0.98*** (0.01)
Number of people are working	1.00 (0.02)	0.93*** (0.02)	1.01 (0.04)	1.03*** (0.01)
Number of pensions the couples have	0.98 (0.02)	1.00 (0.02)	0.96 (0.04)	1.01** (0.00)
Number of medical insurance the couples have	1.03 (0.04)	0.96** (0.01)	0.98 (0.04)	0.98** (0.01)
p-value ^a	<0.001	<0.001	<0.001	<0.001
Log likelihood	–12,670	–22,690	–22,285.82	–14,930
Akaike information criterion	25,373.68	45,401.94	44,598	29,879.34

Note: The coefficients were transformed to odds ratio. Standard errors are indicated in parentheses. We did not present the coefficients of the zero-inflated model because they were statistically insignificant.

^aWald chi-square test between the full model and the null model.

* $p < 0.05$; ** $p < 0.01$; and *** $p < 0.001$.

4 | DISCUSSION

This study has contributed to testing the cross-national applicability of the shared resource hypothesis in explaining depressive symptom concordance among older adult couples by conducting a study with representative samples and consistent measures across the four countries. The findings have expanded our understanding of cross-national variations in the importance of shared resources and the spousal effect on older adults' depressive symptoms. First, our descriptive results indicated that American and British older couples had relatively better economic and health status than their Chinese and Mexican counterparts. This study also found patterns of depressive symptom concordance between older spouses in the four countries consistent with previous studies (e.g., Meyler et al., 2007).

The APIM results indicated the self and spousal effects of social and economic status were not consistent for all four countries, which partially supported Hypothesis 1. Self-reported physical health was the most consistent predictor of depressive symptoms for both individuals within the couple, again validating the strong associations between physical health and mental health (Fiske et al., 2009). Household income significantly predicted older couples' depressive symptoms in only China and Mexico, probably because of their relatively disadvantaged financial status. Having more living children was an insignificant predictor for American and British couples' depressive symptoms and a significant negative predictor in the China and Mexico models. These inconsistent results may need to be addressed from the perspective of cultural differences and changing societal contexts. In Western culture, especially European American culture, independence and autonomy are enshrined as respected values in individualistic societies (De Medeiros, 2016). Older adults are expected to be independent in their late life unless a severe condition such as a major illness occurs (Uchida, Kitayama, Mesquita, Reyes, & Morling, 2008). Therefore, the loose cultural constraint on filial obligation may partially lead to the finding of insignificant association of the number of children with older couples' depressive symptoms in the United States and UK. In addition, modernization around the world also reduces filial support to older adults because adult children are focused more on their nuclear family (e.g., Aboderin, 2004; Xu & Xia, 2014). Therefore, the decreasing support from children may explain why the number of children could not bolster the older adults' mental health in the four countries.

The model regressing health concordance on couple-level predictors further illustrated that the shared resource hypothesis was not fully supported in the four countries (Hypothesis 2) and demonstrated cross-national variation (Hypothesis 3). Setting aside the physical health indicator, most social and financial measures were not significant predictors in the models for China and Mexico. For American couples, having more people working for pay and more sources of health insurance were associated with higher depressive symptom concordance, consistent



with Hypothesis 2. For British couples, all predictors were significant, but only the signs of household income, education, and health insurance were consistent with Hypothesis 2. However, it needs to be clarified that this study used the absolute value of a difference score as a simple measure of depressive symptom concordance, which covered the sign of gender differences and original size of CESD scores, thus losing some information about the couple's mental health status. The limitation should be remedied by using other approaches to supplement the research findings.

Generally, having higher social status and sufficient social welfare benefits was associated with higher depressive symptom concordance among American and British couples. The shared resource hypothesis emphasizes the importance of mutual support and common assets between couples, and the beneficial effect associated with sharing environments between couples. From this perspective, the results imply the important spousal effect by finding that more resources were associated with higher mental health concordance. Therefore, the results have highlighted the synergistic effect of family-centered intervention (Carman et al., 2013). General physical health was the most consistent and positive predictor of depressive symptom concordance within couples, again highlighting the close association between physical health and mental health among older adults (Siegel et al., 2004). This finding suggests that clinical professionals should pay more attention to the spousal effect on their clients' mental health. Physical health should be the primary consideration when clients present depressive symptoms; couple-centered intervention might be needed, which could achieve a positive synergistic effect.

In addition, no strong evidence of the applicability of the shared resource hypothesis was found in China and Mexico, meaning that the shared resource hypothesis was not very useful in explaining older adult couples' depressive symptom concordance in these two developing countries. Although the reason for this finding needs to be researched further, it could be attributed to national variations in policy environments and social resource availability. This inference is consistent with previous studies. For example, in comparing spousal concordance in using e-cigarettes, Roberts et al. (2017) found that concordance was higher among American couples than for couples in other countries, attributing that result to the more heavily regulated federal law in the United States. The socioeconomic disparity in resource allocation between countries also affected spousal concordance among European couples (Huijts et al., 2009). As the ecological models indicate, people are embedded within social contexts and affected by their surrounding environment (Sallis, Owen, & Fisher, 2015). Accordingly, the couples' health conditions or behaviors are shaped by the circumstances of their policy environments, which is also the key point of the shared resource hypothesis. For the four countries addressed in this study, socioeconomic differences also existed (Adler & Newman, 2002), which might further contribute to the differential applicability of the shared resource hypothesis. With a base of fewer existing resources, older couples in China and Mexico might be more likely to experience more stress from the vicissitudes of reality while also being less able to obtain medical treatment. Therefore, healthcare policymakers should be aware of the contextual effect of socioeconomic status and resource allocation on individuals' health and may resolve the problem from its roots by improving the national level of economic and healthcare resources. In other words, policy advocacy and efforts should be directed to enhance the accessibility of psychological counseling service to low-income older couples.

This study comes with limitations. First, the development of measures in this study was limited primarily by the unavailability of many items across the datasets of all four countries, although we did our best to retrieve existing information to construct the indicators. Even though items were available in some countries, the measurement methods were incomparable, making it inappropriate to include them in the model. However, such unavailable or incomparable items may be important to test the shared resource hypothesis. Future researchers could conduct their own cross-national investigations using a well-developed and comprehensive scale. In addition, this study was not able to measure some characteristics of the marriage, such as the length and quality of marriage, as covariates. Future research may consider adding these important marital measures to explore how they associate with health concordance. Second, we compared only four countries. International family data of HRS include many countries that may be considered for comparison in future studies, although, even with the four countries used in this study, the number of variables that are available and measured in the same manner for all countries is quite limited.

Third, we focused on testing the shared resource hypothesis in this study, but were unable to assess the predictive validity of the assortative mating and affective contagion theories. We do not wish to imply that the shared resource hypothesis was superior to these other two theories or deny their ability to explain depressive symptom concordance. Future research may be focused on comparing the applicability of these different theories. Finally, this study explored the applicability of the shared resource hypothesis in explaining only depressive symptom concordance using cross-sectional data. Future study could expand the discussion of concordance using other health dimensions such as physical health, health behavior, utilization, and other mental health measures such as anxiety or stress. Also, future study can utilize longitudinal data to explore the dynamics of health concordance between couples over time.

5 | CONCLUSION

This study tested the applicability of the shared resource hypothesis in explaining depressive symptom concordance within couples by exploring its cross-national variations in four countries. The analysis has contributed to expanding our understanding of the spousal effect on older adults' depressive symptoms and the theoretical explanation about why spouses depress each other. Results indicated that older

adults' depressive symptoms were related to both his/her own and his/her spouse's social and physical health statuses. The shared resource hypothesis was more applicable to depressive symptom concordance within older couples in the United States and England. Couple-centered intervention is suggested for clinical practice, and the spousal effect should be considered in attempting to resolve the negative consequences of depressive symptoms. The applicability of the shared resource hypothesis was weak in Chinese and Mexican contexts, probably attributed to resource scarcity for older couples. We suggest that policymakers address the contextual effects of socioeconomic status and provide more opportunities for low-income couples to obtain psychological counseling. Efforts by clinical professionals and policymakers should note that spouses could depress each other partly because they share the same environment and resources.

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CONFLICT OF INTEREST

None.

ETHICAL APPROVAL

Not applicable.

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