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Supplement Article

# Social Engagement and Cognitive Function of Older Adults in Mexico and the United States: How Universal Is the Interdependence in Couples?

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## Abstract

**Objectives:** Increased social engagement in older adults has been linked to positive cognitive outcomes; however, it is unclear if the social engagement of husbands and wives influences their own cognition as well as each other's cognition. Moreover, it is unknown if any such patterns persist in different country contexts.

**Methods:** Data from the 2001 Mexican Health and Aging Study (MHAS) and the 2000 Health and Retirement Study (HRS) were combined, and comparable samples of married couples without cognitive impairment at baseline were drawn. Follow-up cognition data was obtained from the 2012 MHAS and the 2012 HRS. Structural equation models (SEM) were used to test the actor–partner interdependence model with moderating effect of country on the association of social engagement with cognition.

**Results:** Significant actor effects were observed for wives in both countries. Actor effects for husbands were observed in the United States only. In Mexico, a significant partner effect was observed where wives' social engagement benefited their own cognition as well as their husbands', but not vice versa. Partner effects were not observed in the United States. No moderation effects of country were observed.

**Discussion:** Our results suggest asymmetric patterns of actor–partner interdependence in Mexico, which may be reflective of the more traditional social role of women, and codependence within the couple. On the other hand, our results for the United States, where each spouse had significant actor effects but no partner effects, may suggest more independence within the couple.

**Keywords:** Cohort analysis, Cross-country study, HRS, Marriage, MHAS

Social participation and engagement typically refers to the activities and behaviors that allows a person to interact with others (Levasseur, Richard, Gauvin, & Raymond, 2010). Activities such as volunteering, talking with friends and family, and attending events have been associated with a wide range of positive health outcomes across different populations of older adults (Buchman et al., 2009; Glass, De Leon, Bassuk, & Berkman, 2006; Holt-Lunstad, Smith, & Layton, 2010). Conversely, social isolation and disengagement have been found to be detrimental to the mental

and physical health of elders (Nicholson, 2012; Shankar, McMunn, Demakakos, Hamer, & Steptoe, 2017).

Social engagement is positively associated with better cognitive outcomes. Several studies have found that socially engaged older adults experience slower cognitive decline (Bassuk, Glass, & Berkman, 1999; Ertel, Glymour, & Berkman, 2008; Zunzunegui, Alvarado, Del Ser, & Otero, 2003) and have lower risk for dementia than less engaged older adults (Crooks, Lubben, Petitti, Little, & Chiu, 2008; Hill, Burdette, Angel, & Angel, 2006; Wang, Karp, Winblad, & Fratiglioni, 2002), despite cumulative life-course factors (Park, Kwon, & Lee, 2017; Van Ness & Kasl, 2003). A meta-analysis of 19 longitudinal studies revealed that low social participation, low frequency of social engagement, and loneliness were each associated with approximately 1.5 times higher risk for incident dementia (Kuiper et al., 2015).

The evidence that social engagement impacts cognitive function at the individual level is strong. However, prior studies have not considered the complex dynamics of interpersonal relationships within households and particularly among married couples. Levels of social engagement are highly correlated between older spouses (Bassuk et al., 1999; Ertel et al., 2008; Zunzunegui et al., 2003). A person may outlive their friends and other family members, hence shrinking social networks may be common in old age for both members of the couple (Crooks et al., 2008; Wang et al., 2002). Older adults may also choose to develop smaller but more closely knit social networks as they age (Park et al., 2017).

Concordance among members of couples has been reported in the literature for cognitive functioning (Dufouil, Alpérovitch, & Group, 2000), social engagement (Hoppmann, Gerstorf, & Luszcz, 2008), and mental and physical health outcomes (Kiecolt-Glaser & Wilson, 2017; Meyler, Stimpson, & Peek, 2007; Strawbridge, Wallhagen, & Shema, 2007; Townsend, Miller, & Guo, 2001). However, the interdependence within couples may be asymmetric and may vary by health outcomes. Research including older Mexican American couples has shown that husbands' well-being and depressive symptoms influenced wives' health whereas the wives' well-being and depression did not impact husbands' health (Peek, Stimpson, Townsend, & Markides, 2006; Stimpson, Peek, & Markides, 2006). A study of U.S. older adults revealed that husbands' memory had a protective association on wives' decline in memory, whereas higher depressive symptoms among wives were associated with increasing depressive symptoms and greater decline in memory for husbands (Gerstorf, Hoppmann, Kadlec, & McArdle, 2009). Finally, a study of older couples in the United States reported that husbands whose wives had dementia were eleven times more likely to also develop dementia, whereas wives had a four times greater risk for dementia if the husband also had dementia (Norton et al., 2010). The ability to predict health outcomes within the couple is due in part to the shared environment and similar risk factors (Meyler et al., 2007).

Limited research has investigated the association of a spouses' social engagement with the cognitive and mental health of the other spouse. In one such study of older couples in Australia, the level of social engagement of husbands was positively associated with their wives' perceptual speed but not vice versa (Hoppmann et al., 2008). One spouse's social engagement may benefit the other spouse's cognitive function because individual social engagement can have benefits for both members of the couple, as the other spouse can benefit indirectly due to the shared environment. (Hoppmann et al., 2008). Furthermore, a spouse may help the other person remain socially engaged, which in turn can benefit that person's cognitive functioning (Hoppmann et al., 2008).

## Country Differences in Health Concordance

Current knowledge on the health concordance between older couples is largely based on research using data from Western countries such as the United States, and it is not known if such concordance is observed in other countries with different social norms for men and women who are married. Mexico is a good example of a different cultural context in which to study health interdependence in couples, as the United States and Mexico are particularly different in dimensions that impact the social roles of men and women in marriage.

In addition, the life-course experienced by the current cohorts of older adults in Mexico and the United States are quite distinct, as they represent vastly different stages of social and economic development, as well as different cultural norms, with key implications for the roles of men and women in a couple. Data from a nationally representative sample of older adults in both countries showed that, in Mexico, women aged 60 years and older in 2012 had an average of 3.6 years of education, while older women of the same age in the United States had 12.8 years of education. Another example is the number of children these two cohorts have. Older women in Mexico had 6.0 children on average, whereas older American women had 2.6. Women in Mexico are also less likely to have worked outside the home compared to those in the United States (14.2% vs 26.5%, respectively).[1] Consequently, women in Mexico may not have as much independence from men compared to those in the United States.

Further, the prevalence of divorce and what it means to be married differs between the two countries. Older adults in Mexico are less likely to be divorced (7.23% vs 13.2%) and have fewer number of marriages than those in the United States (1.1 vs 1.4).[1] These differences between the two countries imply differences in the relative standing of

[1] Data from author's weighted calculations from the 2012 Mexican Health and Aging Study in Mexico and the 2012 Health and Retirement Study in the United States.

men and women in a couple and may impact how codependent their health outcomes are.

Our goal is to determine whether the concordance and codependence between men and women in a couple is observed in the relationship between one spouse's social engagement and the other spouse's cognition in both countries, despite the structural and cultural differences, and the different roles and responsibilities for men and women in the two societies. The findings will allow us to assess the universality of patterns that influence well-being of older couples.

It is somewhat difficult to establish "a priori" expectations. On one hand, the effect of a wife's attributes on husband's health may be lower (indicating less codependence) in the United States compared to Mexico, as the social role of women is less traditional, and individuals are more independent. However, it may also be tighter (indicating more codependence) as more equal partnerships are formed with more educated and economically active women, with couples having fewer children and remaining as a couple because of individual preferences. Thus, it is unclear which pattern we should expect in our cross-national comparisons.

Regarding gender differences, and following previous literature, we postulate that wives' social engagement will have strong partner effects on their husbands' cognition in both countries given greater social engagement of women outside of marriage and more dependence of the man on the marriage for social support. We also hypothesize that, in both countries, this effect will be asymmetric, that is, compared to the wife's influence on the husband, men's social engagement will not contribute as positively to their wives' cognitive function and vice versa.

## Method

### Data Set

We used data from the Health and Retirement Study (HRS) for U.S. couples (Sonnega et al., 2014) and the Mexican Health and Aging Study (MHAS) for Mexican couples (Wong, Michaels-Obregon, & Palloni, 2017). The HRS is a nationally representative longitudinal study of Americans age 50 and older and their spouses independent of age. HRS covers topics such as demographics, health conditions, family structure, and relationship, etc. Although the survey has occurred biannually since 1992, we used wave 5 (2000) as baseline and wave 11 (2012) as follow-up in this study to increase temporal comparability with the MHAS. These waves had 85.4% and 89.6% response rate, respectively. We used the RAND HRS longitudinal file 2014 (V2) (Bugliari et al., 2018), supplemented by variables of the 2000 and 2012 RAND Fat files that were not included in the longitudinal RAND HRS. These files are easy-to-use data sets based on the HRS core data (Bugliari et al., 2018).

The MHAS study is highly comparable to the HRS in its study design, sampling technique, and questionnaire. It is a nationally representative longitudinal study of Mexicans aged 50 years and older and their spouses (regardless of age). The survey was completed in 2001, 2003, 2012, and 2015. We used wave 1 (2001) as baseline and wave 3 (2012) as follow-up in this study, with response rates of 91.8% and 88.1%, respectively. We used the longitudinal Harmonized MHAS file provided by the Gateway to Global Aging (Michaels-Obregon et al., 2017), supplemented by variables of the original 2001 and 2012 MHAS that were not included in the harmonized version. The RAND HRS and Harmonized MHAS were used because the data is already structured for couple-level analysis and variable names follow the same format, facilitating data comparability. In both surveys, spouses of selected respondents are study participants, and are asked the same questions as the target respondent selected by the sampling design.

### Analytical Sample

Detailed inclusion/exclusion criteria are presented in Supplementary Appendix Figure 1 for the MHAS and Supplementary Appendix Figure 2 for the HRS. Individuals living in couples are the analytical unit in this study. Thus, we excluded all noncouple households in both data sets. We excluded proxy interviews because the proxy cognitive measures in the HRS ($n$ = 460 couples) and MHAS ($n$ = 397 couples) are considerably different from the cognitive assessments given to participants who can complete an interview. In the HRS, we restricted couples to those in which both members were non-Hispanic Whites for two reasons: (a) the number of non-White race concordant couples in the HRS is very small, and (b) there is no race/ethnic variation in the MHAS which leads to collinearity with the inclusion of a race/ethnicity variable in the models. Couples at baseline in which one or two individuals died or left the study, or were interviewed by proxy, or divorced by the follow-up wave (2012) were also excluded. Further, we excluded couples that had missing study variables (See Supplementary Appendix Figures 1 and 2). While the primary sample was designed to represent individuals aged 50 years and older, data were also collected on spouses regardless of age, thus our sample also includes spouses who are younger than 50.

In order to examine the cognitive function at follow-up, we restricted the sample to couples with normal cognition at baseline. To exclude those with poor cognition, we estimated a separate ordinary least squares model for verbal memory learning and recall scores that adjusted for age and years of education as continuous variables. These tasks are the only two comparable tasks between the HRS and MHAS in the *baseline* years. We followed the 10/66 Dementia Research Group cutoff point for memory impairment (Prince et al., 2008) and excluded participants whose standardized residuals for verbal learning or recall from the OLS models were 1.5 *SD* or more below the mean for either

cognitive task. If one person of the couple was excluded due to any exclusion criteria, then the other person was also excluded. The final sample size was 1,417 couples in the MHAS ($N$ = 2,384) and 1,418 couples in the HRS ($N$ = 2,386).

## Dependent Variable

The cognition at approximately 11 years follow-up was measured as a continuous variable. In the MHAS, cognition was measured with a modified version of the Cross-Cultural Cognitive Examination. In the HRS, cognition is measured with a modified version of the Telephone Interview for Cognitive Status (TICS). Total cognition scores were calculated separately for the MHAS (range 6–108) and the HRS (range 1–27). In the MHAS the tasks used to calculate total cognition score were: verbal memory immediate and delayed recall (each ranges 0–8), visuospatial learning and recall (each ranges 0–6), visual scanning (range 0–60), verbal fluency (range 0–50), backwards counting (range 0–2), and orientation (range 0–3). In the HRS, the tasks used to calculate total cognition score were: verbal memory immediate and delayed recall (each ranges 0–10), backwards counting (0–2), and Serial 7's subtraction (range 0–5).

Because the MHAS and HRS used different items to calculate total cognition scores, we created cognitive scores based on a subset of cognitive tasks available in both data sets to facilitate direct comparison. We calculated the sum of the individual task scores for verbal memory immediate recall, verbal memory delayed recall, and backwards counting. Because the tasks have different scores ranges in each data set, we converted these new cognition scores to z-scores to facilitate comparisons. Z-scores were constructed using the mean and standard deviation of the new cognition scores for each sample separately. Details of these tasks and differences between data sets are listed in Supplementary Appendix Table 1.

## Independent Variable

The main independent variable was social engagement at baseline. Social engagement was assessed by responses to two questions measured at the individual level in both data sets: (a) volunteer activity at religious, educational, health-related or other organization for at least 1 hr per week in the past year (coded as no(0)/yes(1) and (b) currently works for pay (coded as 0/1 (Supplementary Appendix Table 1). A respondent who endorsed any one activity was considered to be socially engaged (yes) compared to those who did not endorse any activities (no).

## Covariates

Country was included in the models of the combined data and coded as Mexico (1) and the United States (0). The presence of comorbidities were counted as "yes" for respondents who said that a physician had told them they had ever had either hypertension, stroke, heart disease or heart attack, diabetes, or arthritis. We also included difficulty with activities of the daily living (ADLs) as a count of the self-reported limitations with: walking across a room, bathing or showering, eating, getting in or out of bed, or using a toilet. All covariates were measured in the baseline wave for both data sets (2001 in the MHAS and 2000 in the HRS). Education was included and dichotomized as low (vs not low) if the respondent's years of education were 1.5 *SD* or more below the mean for their sample (MHAS low ≤ 1 year; HRS low ≤ 11 years). Age was also included; however, due to residual collinearity with the social engagement variable, particularly for husbands (point-biserial correlation -0.43), age was categorized into three groups: age < 55 years (referent), age 55–59 years, and age 60 years and older.

## Statistical Analysis

We compared baseline characteristics of couples within the HRS 2000 and those within the MHAS 2001 using chi-square tests for categorical variables and *t*-tests for continuous variables. We used the actor–partner interdependence model (APIM) to test the relationships between engagement and cognition. The APIMs were implemented using structural equation models (SEM). The APIMs afford the opportunity to disentangle the actor effects where the association with the outcome is within person (e.g., husband's engagement influences his own cognition) and partner effects where the association is between people (e.g., husband's engagement influences spouse's cognition). APIMs also allow for actor–partner effects for one or more predictors and controls for additional covariates, measured at either the individual or the couple level.

First, we conducted a parallel analysis examining the MHAS and HRS samples separately. These models assessed the association of social engagement with the total cognition score for each sample. The base model included only social engagement and total cognition. The full model added all covariates.

Next, we combined the two countries' samples to assess the APIM. The dependent variable in this analysis was the cognition z-score. The primary model included the cognition z-score, actor and partner social engagement. The next model included all covariates—country (Mexico vs United States), age, education, stroke, diabetes, arthritis, hypertension, heart disease, and ADL limitations. In the third model, the moderation of country on the effects of social engagement was included as the interaction of country with husband's and wife's social engagement. Distributions of model residuals were examined. Because chi-square is almost always significant with large samples (>200 observations), absolute model fit was assessed using the root mean square error of approximation (RMSEA) with values of 0.05 or less indicating good fit as well as the comparative fit index (CFI) with values greater than 0.90 indicating good fit.

The SEMs also allow constraints to be placed on the actor and partner effects. These constraints can be used to test the equivalence of the effects. We tested four different patterns of actor partner effects: actor only, partner only, couples, and a contrast model. The first model was the actor-only model which constrained partner effects to zero while actor effects were unrestricted. The second model was the partner-only model which constrained actor interactions to zero while partner effects were unrestricted. The third model, the couple model, placed an equality constraint on actor and partner effects (e.g., husband's actor effect = husband's partner effect). The fourth model was the contrast model which placed inverse constraints on actor–partner effects (e.g., husband's actor effect = −1 × husband's partner effect). In order to be an improvement on the unrestricted model which included all other covariates, a model needed both statistically significant interaction effects and superior model fit. We did not include sampling weights in the analyses because (a) the sampling frame was not designed to represent couples and (b) because some individuals were not in the sampling frame (i.e., age < 50) and had weights equal to zero. All analyses were performed using Stata 15mp (Stata Corp, College Station, TX).

## Results

Table 1 presents the comparison of baseline characteristics within the MHAS and HRS total samples. In the MHAS, husbands were significantly older than wives by almost 5 years (58.0 vs 53.2 years, respectively, $p < .01$) and had 40% higher rates of social engagement (81.7% compared to 37.1%, respectively, $p < .01$). On the other hand, wives in the MHAS had higher rates of arthritis and hypertension than husbands. In the HRS sample, husbands were older than wives by almost three years on average (62.6 vs 59.4 years, respectively, $p < .01$) and had less than 4% higher rates of social engagement than wives (70.7% vs 66.9%, respectively, $p < .05$). Husbands also had higher rates of diabetes, heart disease, and hypertension than wives while wives had higher rates of arthritis than husbands.

A diagram of the base APIM is depicted in Figure 1A, and the results of the parallel APIMs using total cognition scores are presented in Table 2. The partner rows present the social engagement effects associated with either the husband's or wife's cognition, presented in their respective column. That is, the partner effects under the husband column indicate the (partner) effect of the wife's social engagement on the husband's cognition. In the MHAS, a significant and positive actor effect—the effect of an individual's social engagement on their own cognition—remained after adjustment for covariates for wives only ($\beta_{std} = 0.11$, $p < .01$). A significant and positive partner effect was observed for husbands, that is, the effect of the wife's social engagement influenced the husband's cognition ($\beta_{std} = 0.08$, $p < .01$), but not vice versa. For both husbands and wives, older age, low education, and diabetes were associated with lower cognition scores.

In the HRS, a significant and positive actor effect was found for both husbands and wives ($\beta_{std} = 0.08$, $p < .05$ and $\beta_{std} = 0.11$, $p < .01$, respectively), while a partner effect was not observed in the full model. Older age and low education were associated with lower cognition scores for both husbands and wives. Diabetes and ADL limitations were associated with lower cognition scores in husbands but not wives, while stroke, arthritis, and heart disease were associated with lower cognition in wives but not husbands.

The simplified path diagram for the SEMs including the moderation interactions is depicted in Figure 1B, and the results of the combined data models are presented in Supplementary Appendix Table 2. In the full model without interactions (middle panel), cognitive status significantly differed between the United States (ref.) and Mexico, for wives. Actor effects were significant and positive for both husbands and wives. Partner effects were only significant

**Table 1.** Sample Characteristics of Cognitively Intact Couples from the 2001 MHAS ($n$ = 1,417) and the 2000 HRS ($n$ = 1,418) Samples—Mean (*SD*) or %

| | MHAS | | | HRS | | |
|---|---|---|---|---|---|---|
| | Husbands | Wives | | Husbands | Wives | |
| Age (years) | 58.0 (6.5) | 53.2 (7.7) | ** | 62.6 (6.7) | 59.4 (7.3) | ** |
| Low Education[a] | 17.2 | 18.1 | | 11.8 | 9.9 | |
| Stroke | 1.1 | 1.3 | | 2.3 | 1.6 | |
| Diabetes | 11.8 | 11.9 | | 10.5 | 6.4 | ** |
| Arthritis | 12.1 | 19.1 | ** | 44.9 | 50.6 | ** |
| Heart disease | 3.0 | 1.8 | * | 19.0 | 10.1 | ** |
| Hypertension | 26.9 | 41.2 | * | 43.0 | 35.3 | ** |
| ADL limitations | 0.1 (0.4) | 0.1 (0.4) | | 0.1 (0.4) | 0.1 (0.3) | |
| Social Engagement (yes) | 81.7 | 37.1 | ** | 70.7 | 66.9 | * |

*Notes*: $p$-values represent test of difference between husbands and wives in each country. ADL = activities of the daily living.
[a]Low education was defined as <1 year in the MHAS and <12 years in the HRS.
*$p$-value < .05, **$p$-value < .01.

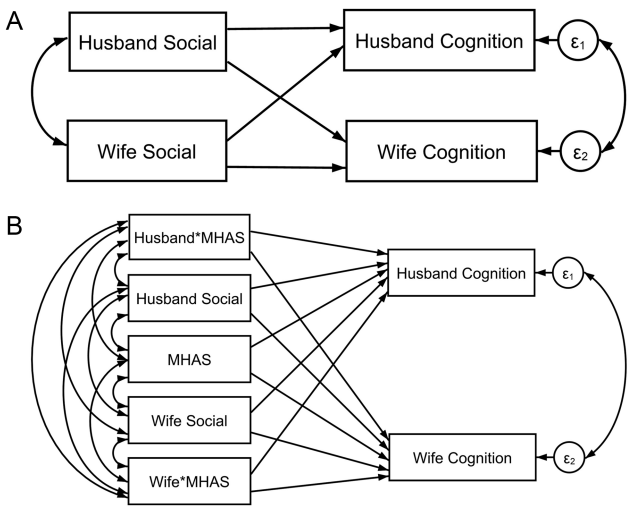


**Figure 1.** Path diagram of a structural equation model for the actor–partner interdependence model of the association of social engagement at baseline with cognition at follow-up—(A) base model and (B) model with country of origin as a between dyads moderator (MHAS = 1, HRS = 0). HRS = Health and Retirement Study; MHAS = Mexican Health and Aging Study.

and positive for husbands, that is, the effect of the wife's social engagement impacted the husband's cognition, but not vice versa.

The moderation model with the interaction between social engagement and country was not substantially different from the model without interaction with respect to the main actor–partner effects remaining significant and positive. However, the interaction effects were not significant.

The results of tests of constraints in the moderation model are presented in Supplementary Appendix Table 3. The actor-only model constrained partner interaction effects to zero, the partner-only model constrained actor effects to zero, the couple model place equality constraints on the actor–partner interaction effects separately for husbands and wives, and the contrast model imposed inverse constraints on the actor–partner effects for husbands and wives. While the tested models showed no substantial decay in fit compared to the unrestricted model, none of the tested models (actor only, partner only, couples, contrast) resulted in significant interaction effects, indicating no evidence for a gender specific pattern in the moderation of the effect of social engagement by country.

## Discussion

In this cross-national comparison of data from the United States (HRS) and Mexico (MHAS), we sought to identify actor–partner patterns in the effects of social engagement on cognition and the potential for these effects to vary by country. While our results did not suggest a moderation effect by country, we did identify both commonalities and differences. First, the results show that the social engagement of wives influenced their own cognition in both the United States and Mexico. However, husbands' social engagement affected their own cognition only in the United States. On the other hand, a partner effect was only observed in Mexico, where wives' social engagement affected husbands' cognition, but not vice versa. These results confirm the hypothesis that wives' social engagement will have a stronger partner effect on their husbands' cognition than vice versa. However, the fact that this partner effect was only observed in Mexico suggests that our a priori hypothesis seems to hold, namely that compared to Mexico, members of U.S. couples were less codependent than Mexican ones to the point that there were no partner effects observed for the United States.

Although husbands were more likely to be socially engaged than wives were in both countries, wives' cognition strongly benefited from their own social engagement in both countries, while husbands' cognition only benefited from their own social engagement in the United States, but with a smaller effect size than the one for women. We speculate that husbands in Mexico, although more engaged in interactions with others outside the household, seem to reap no cognitive function benefit from these interactions, either for their own or their spouse's function. Outside activities for Mexican husbands are related to work, and the nature of their work may have more physical than cognitive demands compared to their counterparts in the United States.

Our finding that the partner effect of wives' social engagement on husbands' cognition was only observed in Mexico seems consistent with major differences in the relative standing of men and women in a couple between the two countries, and hence how codependent their health is in each country. First, wives in the United States are more likely to be educated and work outside the home, which suggests they have a less traditional social role than wives in Mexico, and that individuals are more independent within the couple. On the other hand, husbands in Mexico may be more dependent on their wives for caregiving (food preparation, household management) as wives are less likely to work in the formal sector outside the home (King, 2011). This dependence may extend beyond household activities into cognitive activities as well. Any such benefit would remain only so long as the wife remains healthy and engaged. Wives with high levels of social engagement may be more likely to engage their husbands in conversation providing a level of social engagement not measured in our scale.

Overall, the partner effect in Mexico suggests a lack of reciprocity of effects between husbands and wives. This lack of reciprocity is not entirely surprising; other research of married couples has found imbalanced benefits. In their study of married couple in the HRS, Ayotte and colleagues found reciprocal relationships between husbands and wives depression (Ayotte, Yang, & Jones, 2010). However, they also observed that a husband's chronic conditions were associated with increases in their spouse's depression, while a wife's chronic conditions had no impact on their husband's

**Table 2.** SEM Results from Parallel Analyses of the MHAS and HRS Actor–Partner Interdependence Models of the Association of Social Engagement (y/n) with Total Cognition Scores—Standardized Coefficients and SE

| | **MHAS** (*N* = **1,417**) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Base model** | | | | | | **Full model** | | | | | |
| | **Husband's cognition** | | | **Wife's cognition** | | | **Husband's cognition** | | | **Wife's cognition** | | |
| Social engagement | *β*std | *SE* | | *β*std | *SE* | | *β*std | *SE* | | *β*std | *SE* | |
| of Actor | 0.11 | 0.03 | ** | 0.07 | 0.03 | ** | 0.05 | 0.03 | *p* = .056 | 0.11 | 0.02 | ** |
| of Partner | 0.11 | 0.03 | ** | 0.11 | 0.03 | ** | 0.08 | 0.02 | ** | 0.01 | 0.02 | |
| Age < 55 (ref) | | | | | | | | | | | | |
| Age 55–60 | | | | | | | −0.10 | 0.03 | ** | −0.10 | 0.02 | ** |
| Age 60+ | | | | | | | −0.30 | 0.03 | ** | −0.23 | 0.02 | ** |
| Low education | | | | | | | −0.23 | 0.02 | ** | −0.29 | 0.02 | ** |
| Stroke | | | | | | | 0.00 | 0.02 | | 0.03 | 0.02 | |
| Diabetes | | | | | | | −0.11 | 0.02 | ** | −0.70 | 0.02 | ** |
| Arthritis | | | | | | | −0.05 | 0.02 | * | −0.01 | 0.02 | |
| Heart disease | | | | | | | 0.30 | 0.02 | | 0.02 | 0.02 | |
| Hypertension | | | | | | | 0.00 | 0.02 | | −0.05 | 0.02 | * |
| ADL limitations | | | | | | | −0.02 | 0.02 | | −0.02 | 0.02 | |
| Fit | | | | | | | | | | | | |
| RMSEA | | | | | | | 0.05 | (0.04, 0.06) | | | | |
| CFI | | | | | | | 0.93 | | | | | |
| | HRS (*N* = (1,418) | | | | | | | | | | | |
| | Base model | | | | | | Full model | | | | | |
| | Husband's cognition | | | Wife's cognition | | | Husband's cognition | | | Wife's cognition | | |
| Social engagement | *β*std | *SE* | | *β*std | *SE* | | *β*std | *SE* | | *β*std | *SE* | |
| of Actor | 0.15 | 0.28 | ** | 0.08 | 0.28 | ** | 0.08 | 0.03 | * | 0.11 | 0.03 | ** |
| of Partner | 0.08 | 0.27 | ** | 0.19 | 0.29 | ** | 0.06 | 0.03 | *p* = .055 | 0.05 | 0.03 | |
| Age < 55 (ref) | | | | | | | | | | | | |
| Age 55–60 | | | | | | | −0.06 | 0.06 | | −0.06 | 0.04 | ** |
| Age 60+ | | | | | | | −0.20 | 0.06 | ** | −0.19 | 0.04 | ** |
| Low education | | | | | | | −0.22 | 0.03 | ** | −0.20 | 0.03 | ** |
| Stroke | | | | | | | 0.00 | 0.03 | | −0.08 | 0.03 | ** |
| Diabetes | | | | | | | −0.08 | 0.03 | ** | −0.05 | 0.03 | |
| Arthritis | | | | | | | −0.04 | 0.03 | | −0.06 | 0.03 | * |
| Heart disease | | | | | | | −0.01 | 0.03 | | −0.09 | 0.03 | ** |
| Hypertension | | | | | | | 0.02 | 0.03 | | −0.02 | 0.03 | |
| ADL limitations | | | | | | | −0.07 | 0.03 | ** | −0.04 | 0.03 | |
| Fit | | | | | | | | | | | | |
| RMSEA | | | | | | | 0.03 | (0.01, 0.04) | | | | |
| CFI | | | | | | | 0.96 | | | | | |

*Note*: ADL = activities of daily living; CFI = comparative fit index; *β*std = standardized betas; HRS = Health and Retirement Study; MHAS = Mexican Health and Aging Study; RMSEA = root mean square error of approximation; SE = standard errors.
**p*-value < .05; ***p*-value < .01.

depression. This imbalance suggests a difference in the roles wherein wives may feel an additional caretaking burden when their spouse becomes ill. In their study of spousal memory and depression, Gerstorf and colleagues found differential effects wherein a wife's depression was associated with a decline in the husband's memory, but not vice versa (Gerstorf et al., 2009). It is possible that a wife's depression interferes with household tasks, caretaking, or social interactions which in turn contribute to a husband's decline in memory.

The negative effect of country (Mexico) on cognition in the base model (without interaction) for wives may reflect differences in levels of education between the countries and other sources of variation that we did not control

for. Although we attempted to adjust for these differences between samples by including the country relative metric "low education," our designation of "low" may not mean the same in both countries with respect to relative cognitive demands. Additionally, it is possible that, despite standardizing the cognition scores by gender and country, the scores scaling still represents different structures between the United States and Mexico. Lastly and perhaps more important, it is also possible that there are unmeasured factors related to a lower measure of cognition in Mexico compared to the United States.

### Limitations

Several important limitations should be mentioned. Cross-national comparisons are difficult especially when the countries being compared have not only different languages and customs but also different distributions of age, education, illness, and impairment. While we adjusted all models for these covariates, it is quite likely that unmeasured differences between the samples remain. An additional limitation was the comparability of the cognitive domains used to generate a compatible scale in both samples. We were limited in the subcomponents that were common in both samples (immediate recall, delayed recall, backwards counting), which may be limited in capturing cognition as a whole. In addition, the sub scales used had slightly different response categories, making an exact comparison impossible. We attempted to overcome this obstacle by standardizing the combined scales into comparable z-scores. In addition, the MHAS cognitive battery includes only a single test for each cognitive domain restricting domain specific comparisons. However, the work by James et al. found that increased social activity was associated with slower decline across all five domains of cognition in their battery. This suggests that subdomain analysis may add little information beyond examination of the total score (James, Wilson, Barnes, & Bennett, 2011). Our sample inclusion criteria requiring nonproxy response is another potential limitation. In both samples, those with proxy responses were older on average than nonproxy respondents, had lower levels of education and higher levels of ADL limitations. Finally, our measure of social engagement was similarly limited to common components in both samples at the individual level, and it is likely that there are additional components of social engagement that were not captured by our measure.

## Conclusion

Our results suggest that despite vast differences in socioeconomic levels between the United States and Mexico, and in the life-cycle contexts in which surviving older adults have lived, certain patterns of actor–partner effects for social engagement and cognitive function emerge as common for both countries. There are clear gender differences; among couples of old adults, the wife's own social engagement benefits her cognition in both countries. The husband's social involvement benefits his own cognition only in the United States. In regards to partners affecting each other, the husband's social engagement seems to offer *no* benefit to the wife's cognition in both countries. And for Mexico only, the wife's social engagement benefits her husband. We are drawn to the conclusion that the interdependence of health between members of couples is not universal, and it does not apply to the social engagement benefits for cognitive aging. Future studies should examine potential mediators of the nonreciprocity between members of couples and continue to understand gender differences in old age well-being. Additional research should also extend the analysis to other samples to determine how universal these actor–partner effects may be.

## Supplementary Material

Supplementary data are available at *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* online.

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Author contributions: B. Howrey planned the study, performed the data analysis, wrote the paper, and revised the manuscript. J. Avila performed the data management, descriptive data analysis, helped to write the methods and

results, and revised the manuscript. B. Dower planned the study, helped to write the introduction and discussion, and revised the manuscript. R. Wong planned the study, helped to write the introduction and discussion, and revised the manuscript.

## Conflict of Interest

None reported.

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