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Research Article

Linked Lives: Dyadic Trajectories of Cognitive Function Among Middle-Aged and Older Couples

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Abstract

Objectives: Our study is among the first to analyze the developmental trajectories of cognitive function at the couple level.

Methods: Using longitudinal dyadic data obtained from 2,130 heterosexual couples who participated in the China Health and Retirement Longitudinal Study between 2011 and 2020, we employed the dyadic latent growth curve model to analyze the developmental trajectories of wives' and husbands' cognitive function from 2011 to 2018. We examined the significant predictors of membership of the latent profiles, as well as the extent to which membership of the latent profiles predicted husbands' and wives' depressive symptoms at follow-up (i.e., in 2018 and 2020).

Results: The two identified dyadic profiles reflected distinct developmental trajectories at the couple level: high stable couples with outperforming husbands (Profile 1, 81.6% of couples), and moderate stable wives—moderate rapid decline husbands (Profile 2, 18.4% of couples). Husbands' older age and higher number of functional limitations, and couples' residence in rural areas at baseline predicted a higher likelihood of membership in Profile 2. Husbands reporting more chronic conditions at baseline predicted a lower likelihood of the couple being classified in Profile 2. Couples in Profile 2 exhibited higher levels of depression symptoms than their counterparts in Profile 1 in 2018 and 2020.

Discussion: Our results highlight the utility of a couple approach in analyzing the developmental trajectories of cognitive functioning in later life and advance our understanding of how couple-level changes exert influence on both spouses' mental health.

Keywords: China Health and Retirement Longitudinal Study, Developmental trajectory, Dyad research, Dyadic latent growth curve model

Most health and aging research employs an individual approach. However, married couples' functioning and developmental trajectories are intricately intertwined in various life domains, such as frailty, functional limitations, chronic disease, mental well-being, and health behaviors (Ayotte et al., 2010; Hoppmann et al., 2011; Kong et al., 2023a; Monin et al., 2016). This study aims to extend existing research by classifying the developmental trajectories of cognitive function among married couples and employing an innovative model for analyzing longitudinal data collected from both partners. In contrast to past studies that have focused on individual trajectories, analyzing couples as a unit enhances our knowledge of the interdependence between spouses in cognitive function, a topic that currently lacks understanding. Studying couple-level trajectories is crucial because cognitive decline is often a shared experience influenced by mutual interactions, support systems, and shared environments. Understanding these interdependencies can reveal how partners influence each other's cognitive health, leading to more effective relationship-centered interventions and support strategies for aging populations.

Several previous studies have examined dyadic trajectories in various domains, such as sexual satisfaction among newlywed couples (Ghodse-Elahi et al., 2021), loneliness trajectories in older couples (Ermer et al., 2020), and quality of life and happiness trajectories in married couples (Bourassa et al., 2015; Hoppmann et al., 2011). The aforementioned research demonstrates that spouses have a significant influence on and are influenced by each other's physical and mental well-being (Gerstorf, Hoppmann, Kadlec, et al., 2009). As such, husbands' and wives' developmental trajectories and changes in the examined domains are expected to be interconnected and covary over time. Nevertheless, to the best of our knowledge, there has been no empirical investigation of the dyadic trajectories of cognitive function in middle-aged and older couples. While cross-sectional research has documented a correlation in cognitive function between husbands and wives (Dufouil & Alpérovitch, 2000), it is unclear if temporal

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changes in cognitive function are influenced by the spousal context. Existing longitudinal studies on cognitive function have predominantly employed an individual-centric approach in which individuals are the unit of analysis (Clouston et al., 2020; Steptoe & Zaninotto, 2020). Thus, we have limited knowledge regarding the longitudinal trajectories of cognitive function in husbands and wives, as well as the mental health consequences associated with these trajectories during middle and late adulthood.

A growing body of literature indicates that an individual's cognitive disorder can be a risk factor for their spouse's cognitive decline or even dementia (Yang et al., 2021). For instance, individuals with spouses who have dementia have a sixfold higher risk of developing dementia compared to those whose spouses do not (Norton et al., 2010). Furthermore, previous studies have shown that there is a cognitive contagion effect between spouses, which reflects within-couple similarities and intrinsic linkages between aging-related changes in cognitive function for both partners (Das, 2024; Gerstorf, Hoppmann, Kadlec, et al., 2009; Hoppmann & Gerstorf, 2009). When one spouse undergoes changes in cognitive function, it may be necessary for the couple to reassess and rearrange their roles and responsibilities. This could involve the acquisition of new abilities by one spouse to take over tasks previously performed by the other, or one spouse may even take on a caregiving role to support the other with compromised cognitive functioning in managing everyday activities (Gerstorf, Hoppmann, Kadlec, et al., 2009).

As such, focusing on one person in a couple might obscure important interpersonal dynamics and thereby overlook potential opportunities to simultaneously enhance the well-being of both partners. To address this knowledge gap, this study utilizes longitudinal data from both spouses of 2,130 heterosexual couples over a span of 10 years to (a) characterize latent dyadic cognitive function trajectories among husbands and wives and (b) examine how the identified dyadic trajectory memberships predict depressive symptoms of both spouses two years later.

Theoretical Framework

Two theories guided the design of this study. First, the shared resource hypothesis posits that couples' health statuses are concordant because they share a common physical and social environment (Meyler et al., 2007). For instance, couples share similar health behaviors (e.g., diet, smoking, drinking, and exercising) and major life events, such as the occurrence of chronic diseases (Jackson et al., 2015; Johnson et al., 2006; Jurj et al., 2006; Kong et al., 2023b). Prior research has also indicated that couples may shape each other's participation in social activities (Lam & Bolano, 2019). Generally, couples share similar patterns of activity engagement (e.g., husbands and wives may participate in similar cognitively stimulating or other community-based activities), except when one partner needs to care for the other owing to health issues that constrain joint participation (Lam & Bolano, 2019). These couple-based patterns are stronger in later life because older couples have been exposed to a shared environment for longer periods of time (Ferrer et al., 2005; Umberson et al., 2006).

Given the significant interdependence between couples' lifestyles and the fact that lifestyle factors are the primary risk factors for cognitive decline and dementia (Livingston et al., 2020), it was anticipated that couples' cognitive functions would be interdependent and covary over time. Furthermore, emotional contagion—the process through which one's emotional states affect those of the partner—may play an important role in shaping the mental health outcomes of couples experiencing cognitive decline. Prior studies have indicated that emotional contagion is gendered, with wives more likely to be affected by their husbands' emotional states than the reverse (Magen & Konasewich, 2011). As such, wives are more likely to experience emotional contagion and caregiving strain when their husbands experience cognitive decline. The unique cultural context of China, emphasizing traditional gender roles, may amplify these gendered effects.

Second, according to the theory of dyadic illness management, when one spouse encounters chronic illnesses or deterioration, both partners appraise and manage the situation collaboratively as an integrated unit rather than as distinct individuals (Lyons & Lee, 2018).

In general, couple-level concordance regarding health issues or deterioration promotes collaborative management behaviors and favorable individual and relationship outcomes, while couple-level incongruence may disrupt communication and result in adverse outcomes. However, the inherent diversity must be noted because the dyadic illness management process and its association with well-being may vary across different contextual factors, including illness type and symptoms (Lyons & Lee, 2018).

In the context of cognitive decline, an important caveat is that concordant cognitive decline in both partners may not be inductive to positive outcomes due to the multifaceted challenges related to cognitive impairment, such as communication barriers and disruptions to marital relationships (Evans & Lee, 2014). Moreover, the sociocultural contexts in which dyadic processes are embedded should be considered. Given the traditional gender role expectations on women to be caregivers and shoulder the primary responsibilities of managing the health issues of both spouses, a wife's health problems—which limit her caregiving capabilities—may pose greater challenges for the couple than a husband's health problems (Acitelli & Badr, 2005; Karraker & Latham, 2015). In Chinese societies, where traditional gender norms are especially ingrained due to long-held patriarchal norms (Ji et al., 2017), such gendered dynamics may be especially evident.

The Present Study

Four hypotheses were formulated based on the theories mentioned above. (*H1*) Husbands' and wives' cognitive functions are concordant over time. (*H2a*) These concordant changes in cognitive function generally predict fewer depressive symptoms in both partners. This is because couples who share similar levels of cognitive functioning experience favorable relational outcomes, such as enhanced communication, marital support, and satisfaction, which then yield health advantages (Lyons et al. 2025). (*H2b*) Discordant changes in cognitive function predict more depressive symptoms in both partners. This is because discordant changes and subsequent within-couple imbalances in cognitive function may strain the relationship and impede mutual support, resulting in a deterioration of both relational and individual well-being (Novak et al., 2023). Based on the gendered dynamics, we expect that couples in which wives experience cognitive decline will exhibit elevated depressive symptoms compared to the reverse scenario. (*H2c*) In couples where both partners experience significant cognitive decline that undermines their capabilities to care for themselves and for one another, both partners may exhibit elevated levels of depressive symptoms.

This study aims to examine dyad trajectories in cognitive function over time and to link these trajectories to both spouses' subsequent depressive symptoms. This study will strengthen the current body of research in three critical respects. First, by characterizing the developmental trajectories of husbands' and wives' cognitive function simultaneously, we aim to capture the interdependence of cognitive function trajectories in middle-aged and older couples (i.e., aged 45 and above). Utilizing an individual-centric approach, most existing trajectory research on cognitive function focuses on one person. However, by incorporating data from both spouses, we modeled the dyadic trajectories of cognitive function. This allowed us to gain a deeper understanding of how spouses influence and are influenced by each other's cognitive function over time. Second, evaluating the psychological implications of dyadic trajectory memberships for both partners has the potential to guide the design of couple-centered mental health interventions. Ultimately, an enhanced understanding of the interconnectedness between the cognitive function of husbands and wives over time can provide valuable insights for creating couple-based wellness intervention strategies.

Method

Data and Sample

The data in this study were derived from the China Health and Retirement Longitudinal Study (CHARLS), collected between 2011 and 2020. CHARLS, administered by Peking University, targets Chinese residents aged 45 and above. The study employed a multistage probability sampling strategy and a probability-proportional-to-size sampling technique to ensure national representativeness. CHARLS data span various dimensions, including demographic health, socioeconomic status, lifestyle, and family dynamics, thereby facilitating comprehensive scientific research on social changes associated with aging trends in China (Chen et al., 2021). CHARLS was approved by the Ethical Review Committee of Peking University. The IRB approval number for the main household survey is IRB00001052-11015. All participants signed informed consent forms.

CHARLS is an open-access longitudinal survey dataset. The baseline (or Wave 1) was initiated in 2011, and to date, five waves have been collected (Wave 2 in 2013, Wave 3 in 2015, Wave 4 in 2018, and Wave 5 in 2020). For this study, we merged the harmonized Version D of CHARLS (2011–2018) with the most recent 2020 data. To be included, individuals had to (a) be aged 45 and above, (b) independently complete the questionnaire without proxy responses, (c) provide complete answers to cognitive-related questions at baseline, and (d) couples had to be residing in the same household. These four criteria yielded a final dataset comprising 2,130 dyadic observations of couples from 2011 to 2020. A comparison of the analytical sample and those lost to attrition is provided in Supplementary Table 1 in Supplementary Material.

Measures

Predictors: cognitive function from 2011 to 2018

Cognitive function was measured on four dimensions, as outlined in the Harmonized CHARLS: orientation, memory, numerical calculation, and figure drawing. Orientation was assessed by asking respondents to correctly identify the current day of the month, month, year, and day of the week. Scores for this section range from 0 to 4. Memory was evaluated through both immediate and delayed word recall. Respondents were presented with a list of 10 words and were asked to recall them immediately and again after a short delay. The memory score is the sum of the correctly recalled words from both the immediate and delayed recall sessions, with scores ranging from 0 to 20.

Numerical calculation proficiency was evaluated through a serial subtraction task, starting from 100 and subtracting 7 five consecutive times. Each correct subtraction was scored, ranging from 0 to 5. Figure drawing assessed visuospatial abilities by asking respondents to redraw a picture of two overlapping pentagons. A successful reproduction was scored as 1, while an unsuccessful attempt was scored as 0. The overall cognitive function score is the sum of these four dimensions, creating a composite variable ranging from 0 to 30, where higher scores indicate better cognitive functioning (Lu et al. 2023).

Outcome variables: depressive symptoms in 2018 and 2020

The 10-item Center for Epidemiologic Studies depression scale (CESD-10) was used to measure depressive symptoms. The CESD-10 has demonstrated good reliability and validity among older adults in China (Boey, 1999). This scale was calculated according to the coding scheme of the Harmonized CHARLS. Participants responded to 10 questions regarding the frequency of depressive symptoms over the past week, with response options ranging from "Rarely or none of the time (<1 day)" to "Most or all of the time (5–7 days)." These responses were recorded on a scale from 0 to 3, with two items reverse coded for consistency. The total CESD score, computed by summing responses, ranged from 0 to 30, with higher scores indicating a greater severity of depressive symptoms.

Covariates

The analysis includes baseline individual-level demographic and health characteristics, as well as household-level factors, that have been reported to influence cognitive function and depressive symptoms (Kong et al., 2024). *Sociodemographic variables* included age, retirement status (0 = no, 1 = yes), and educational attainment (categorized as "less than upper secondary education," "upper secondary and vocational training," and "tertiary education"). *Individual-level health characteristics* encompassed self-reported health (continuous, rated from 1 "very poor" to 5 "very good/excellent"), number of chronic conditions (including high blood pressure, diabetes, cancer, lung disease, heart problem, stroke, psychological problems, and arthritis, scored 0–8), and functional limitations (sum of limitations in performing nine physical tasks in CHARLS, scored 0–9, with higher scores indicating more limitations).

Household-level characteristics included marital length at baseline (in years), number of children at baseline, residence type at baseline (0 = urban, 1 = rural), and household income-to-needs ratio calculated based on average household income and average house size from 2011 to 2018. Additionally, the depressive symptoms of both spouses in 2011 (assessed using the CESD-10) were included for baseline control.

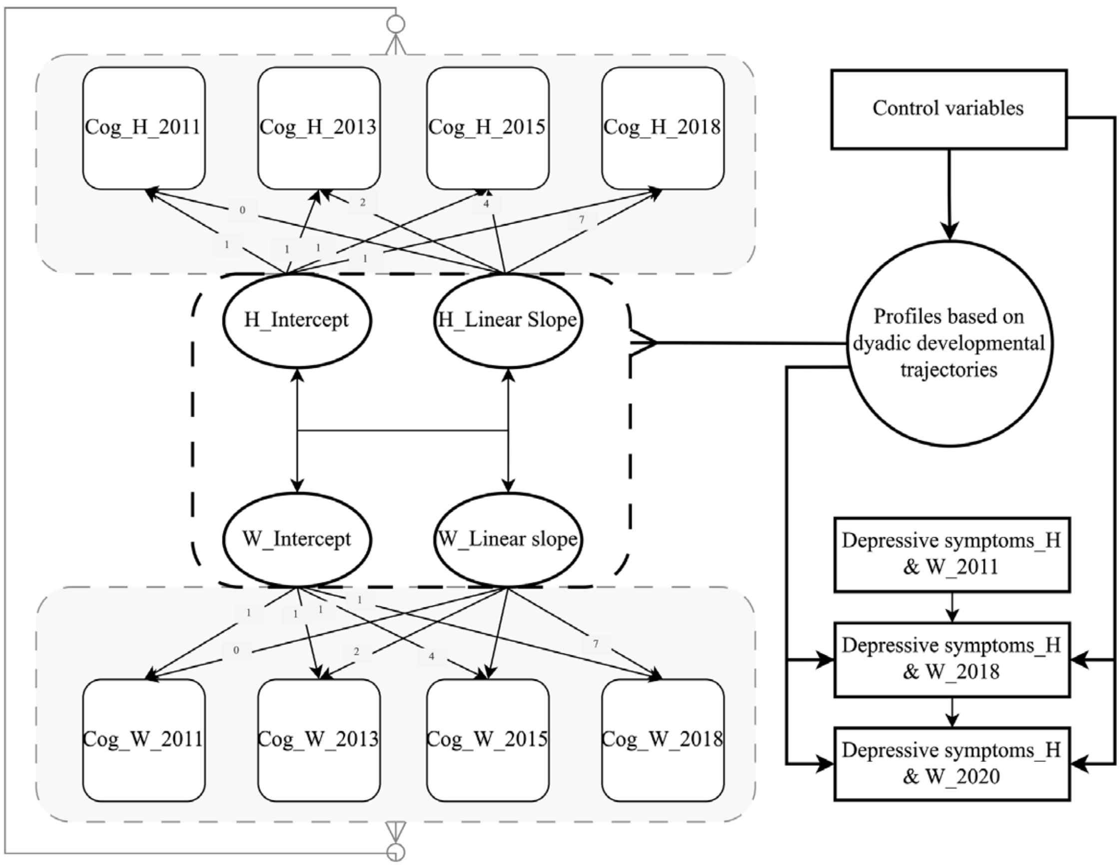

Figure 1. Analytic framework. *Notes.* Cog = cognitive function; H = husbands; W = wives. For sensitivity analyses, we *also* specified an unconditional quadratic growth curve model. Fit indices of the unconditional quadratic growth curve model: χ^2 = 45.90, *df* = 5; CFI = 0.991; RMSEA = 0.062; SRMR = 0.024. Model comparisons suggested that the more complicated unconditional growth curve model was not a better fit than the parsimonious linear growth curve model: $\Delta\chi^2$ = 14.57, $p > .10$ given Δdf = 13; ΔCFI = 0.000. We, therefore, keep the unconditional linear growth model and proceed with profile identification accordingly.

Analytic Procedures

We used Mplus 8.8 to analyze the data, and missing data were handled using full-information maximum likelihood. The analytic model is shown in Figure 1. Following Tong et al. (2023), the analyses proceeded in the following steps (Tong et al., 2023).

Specifying dyadic developmental trajectories model

We utilized the unconditional dyadic latent growth curve model (LGCM; Duncan et al., 2013) in which only husbands' and wives' cognitive functions from 2011 and 2018 were included. The aim was to depict the average developmental trajectories across the whole sample and determine whether husbands' and wives' growth factors (i.e., intercept and slope) had statistically significant variances. Statistically significant variances indicated unobserved heterogeneity in the sample, which is a prerequisite for identifying multiple latent profiles based on the dyadic developmental trajectories model. To account for the nonindependence of husbands' and wives' reports, we estimated the covariance of growth factors. We also estimated the covariance of husbands' and wives' observed scores at each wave (e.g., husbands' scores in 2011 and wives' scores in 2011; Duncan et al., 2013). The model fit of the unconditional dyadic LGCM was evaluated using the chi-square value, comparative fit index (CFI > 0.90), root-mean-square error of approximation (RMSEA < 0.08), and standardized root-mean-square residual (SRMR < 0.08; Kline, 2015).

Identifying latent profiles based on dyadic developmental trajectories

The second step was based on the unconditional dyadic LGCM, and the aim was to determine the number of profiles and the shape of husbands' and wives' developmental trajectories within each profile. This involved fitting several unconditional LPA models with different numbers of profiles and then determining the optimal solution according to model fit, theoretical interpretability, and parsimony (Spurk et al., 2020; Weller et al., 2020). Several fit indices were considered—log-likelihood, Akaike information criterion, Bayesian information criterion (BIC), and sample size adjusted BIC—for all fit indices, with a score closer to 0 indicating a better model fit (Spurk et al., 2020; Weller et al., 2020). To compare models with k classes to a model with k – 1 classes, we considered the Lo–Mendell–Rubin likelihood ratio test and bootstrap likelihood ratio test with 100 random draws. Both tests provide an evaluation of model fit, and a significant result ($p < .05$) indicated the chosen model with k profiles as a better model fit than the more parsimonious model with k – 1 profiles (Spurk et al., 2020; Weller et al., 2020). We also assessed entropy to evaluate whether the resulting profiles were well differentiated. Entropy ranges between 0 and 1, and > 0.60 to > 0.80, are the commonly used cut-offs for adequate entropy (Spurk et al., 2020).

Determining predictors and outcomes of latent profile memberships

The third step was to investigate (a) how control variables listed in the Measures section predicted memberships of latent profiles, and (b) how membership of latent profiles predicted husbands' and wives' depressive symptoms in 2018 and 2020. For this purpose, we used the BCH approach, which saved the BCH weights generated using maximum likelihood estimation with robust standard errors and incorporated these weights into the extended model (Asparouhov & Muthén, 2021). We took this approach because it accounted for the classification errors and can therefore yield an accurate estimation of pathways of research interest (Asparouhov & Muthén, 2021).

The pathways between the control variables and latent profile membership were estimated using logistic regression. The pathways between latent profile membership and outcome variables (i.e., depressive symptoms in 2018 and 2022) were estimated as the mean difference across profiles in 2018 depressive symptoms and 2020 depressive symptoms. When estimating the pathways between latent profile membership and outcome variables, the control variables were accounted for (i.e., we regressed depressive symptoms in 2018 and 2020 on control variables). We also included the autoregressive pathways for robust analyses (i.e., we regressed depressive symptoms in 2018 on depressive symptoms in 2011, and depressive symptoms in 2020 on depressive symptoms in 2018). We also included autoregressive pathways for robust analyses (i.e., we regressed depressive symptoms in 2018 on those in 2011, and depressive symptoms in 2020 on those in 2018).

Results

Descriptive Characteristics

Table 1 displays the descriptive characteristics of the study sample, highlighting significant gender differences between husbands and wives in China. Husbands in the analytic sample were, on average, older ($M = 57.12$, $SD = 7.42$) than wives ($M = 55.22$, $SD = 6.88$). At baseline, 80.4% of men ($n = 1{,}697$) and 70.7% of women ($n = 1{,}493$) were employed. Husbands had significantly greater educational attainment ($p < .001$), with a higher proportion having completed upper secondary ($n = 366$, 17.2% compared to $n = 174$, 8.2%) or postsecondary education ($n = 39$, 1.8% compared to $n = 14$, 0.7%). Wives reported poorer self-rated health ($M = 3.03$, $SD = .89$) compared to husbands ($M = 2.85$, $SD = .90$, $p < .001$), and they also reported a greater prevalence of chronic illnesses and functional limitations. The mean marital duration for the sampled couples was 33.44 years ($SD = 8.25$), and households had an average of 2.48 children ($SD = 1.23$).

Wives consistently reported more depressive symptoms than husbands. In 2018, husbands had a mean score of 7.03 ($SD = 5.66$), while wives had a significantly higher mean of 9.14 ($SD = 6.54$, $p < .001$). In 2020, this trend persisted, with husbands scoring 7.16 ($SD = 5.74$) compared to wives' 9.64 ($SD = 6.46$, $p < .001$). There were significant gender differences in cognitive function. In 2011, husbands had a higher mean score of 15.93 ($SD = 4.10$) than wives' mean of 14.71 ($SD = 4.78$), indicating better cognitive function among men. This pattern persisted in subsequent waves.

Dyadic Developmental Trajectories Model

The unconditional dyadic LGCM with linear curve fit the data adequately: $\chi^2 = 60.47$, $df = 18$; CFI = 0.991; RMSEA = 0.033; SRMR = 0.032. The mean and variance of husbands' and wives' intercept and linear slope are shown in Table 2. On average, husbands' and wives' cognitive functions decreased over time. The statistically significant variances of husbands' and wives' intercept and linear slope suggest the heterogeneity of developmental trajectories.

Latent Profiles Based on Dyadic Developmental Trajectories

Table 3 shows the fit indices of the latent profile models with one to seven profiles. The two-profile model was selected because it has the lowest BIC and adequate entropy. Additionally, the two-profile model was a significantly better fit than the one-profile model, but the more sophisticated three-profile model was not a significantly better fit than the two-profile model.

Figure 2 illustrates the shape of the husbands' and wives' developmental trajectories in the selected two-profile model. As shown, the two profiles differed in theoretically meaningful ways. Profile 1 included 81.6% of couples, and husbands' and wives' cognitive functions in this profile were stably high from 2011 to 2018. Further, supplementary analysis suggested that the husbands' intercept was higher than that of wives (difference [husbands − wives] = 1.63, SE of difference = 0.15, $p < .001$). The rate of change was similar between husbands and wives (difference [husbands − wives] = −0.01, SE of difference = 0.04, $p = .870$). Therefore, we called Profile 1 "high stable couples with outperforming husbands."

Profile 2 included 18.4% of the couples. In this profile, husbands' and wives' cognitive functions began at a lower level in 2011, with no statistically significant between-partner differences identified (difference [husbands−wives] = −0.32, SE of difference = 0.46, $p = 0.494$). A decrease was evident over time, with husbands' cognitive function declining at a faster pace than that of their wives (difference [husbands − wives] = −0.39, SE of difference = 0.11, $p < .001$). Therefore, we called Profile 2 "moderate stable wives—moderate rapid decline husbands."

Predictors and Outcomes of Latent Profile Memberships

Table 4 shows how various characteristics at the baseline predicted latent profile membership. Husbands' older age, couples' residence in rural areas, and husbands' higher number of functional limitations predicted a higher likelihood of membership in Profile 2 (vs. Profile 1). Husbands' higher scores for chronic conditions predicted a lower likelihood of membership in Profile 2 (vs. Profile 1).

Panel A of Table 5 presents the relationship between latent profile membership and depressive symptoms in 2018 and 2020, accounting for control variables and autoregressive pathways. Husbands and wives in Profile 2 consistently reported higher depressive symptoms than those in Profile 1 across both years.

Panel B of Table 5 examines gender differences within each profile, calculated by subtracting wives' reports from husbands' reports. Wives consistently reported more depressive

Table 1. Descriptive Characteristics of the Study Sample

Study variables	Total ($N = 4260$)	Husbands ($n = 2130$)	Wives ($n = 2130$)	Difference
Dependent variables				
CESD-10 score in 2018, mean (*SD*)	8.09 (6.20)	7.03 (5.66)	9.14 (6.54)	−13.90***
CESD-10 score in 2020, mean (*SD*)	8.38 (6.23)	7.16 (5.74)	9.64 (6.46)	−13.58***
Independent variables				
Cognition function in 2011, mean (*SD*)	15.32 (4.49)	15.93 (4.10)	14.71 (4.78)	10.95***
Cognition function in 2013, mean (*SD*)	15.92 (4.32)	16.30 (3.99)	15.50 (4.62)	7.05***
Cognition function in 2015, mean (*SD*)	15.33 (4.47)	15.56 (4.10)	15.08 (4.84)	3.98***
Cognition function in 2018, mean (*SD*)	15.69 (5.23)	15.76 (4.96)	15.61 (5.53)	2.43*
Individual-level covariates				
Age in 2011, mean (*SD*)	56.17 (7.21)	57.12 (7.42)	55.22 (6.88)	27.46***
Retirement status in 2011, *n* (%)				
0. No	3,190 (75.5%)	1,697 (80.4%)	1,493 (70.7%)	
1. Yes	1,035 (24.5%)	415 (19.6%)	620 (29.3%)	332.88***
Education levels in 2011, *n* (%)				
1. Less than lower secondary	3,667 (86.1%)	1,725 (81.0%)	1,942 (91.2%)	
2. Upper secondary & vocational training	540 (12.7%)	366 (17.2%)	174 (8.2%)	
3. Tertiary	53 (1.2%)	39 (1.8%)	14 (0.7%)	279.70***
Self-reported health in 2011, mean (*SD*)	2.94 (0.90)	2.85 (0.90)	3.03 (0.89)	−7.66***
Chronic conditions in 2011, mean (*SD*)	0.85 (0.94)	0.78 (0.90)	0.91 (0.97)	−4.90***
Functional limitations in 2011, mean (*SD*)	1.41 (1.64)	1.08 (1.49)	1.75 (1.73)	−15.35***
Household-level covariates				
Marital length in 2011, mean (*SD*)	33.44 (8.25)			
Number of kids in 2011, mean (*SD*)	2.48 (1.23)			
Residence in 2011				
0. Urban community	1,576 (37.0%)			
1. Rural village	2,684 (63.0%)			
Income-to-need ratio across 2011 to 2018, mean (*SD*)	2.94 (6.58)			
Household income in 2011, mean (*SD*)	29,935.05 (75,766.84)			
Household income in 2013, mean (*SD*)	30,845.81 (47,467.34)			
Household income in 2015, mean (*SD*)	23,810.52 (45,802.96)			
Household income in 2018, mean (*SD*)	42,505.46 (97,628.17)			
Household size in 2011, mean (*SD*)	3.85 (1.83)			
Household size in 2013, mean (*SD*)	3.82 (1.87)			
Household size in 2015	3.18 (1.32)			
Household size in 2018	2.89 (1.45)			

Notes: For differences in continuous variables, we used paired *t* tests and reported *t* values along with significance levels. For categorical variables, we used Pearson chi-square tests and reported chi-square values along with significance levels.
*$p < .05$. **$p < .01$. ***$p < .001$ (two-tailed).

Table 2. Mean and Variance for Intercept and Linear Slope in the Unconditional, Dyadic LGCM

Parameters	Husbands		Wives	
	Mean	Variance	Mean	Variance
Initial levels (in 2011)	16.046***	7.177***	14.837***	11.832***
Linear growth (per year)	−0.130***	0.069**	−0.047**	0.042

*$p < .05$. **$p < .01$. ***$p < .001$ (two-tailed).

symptoms than their husbands, as evidenced by the negative gender difference scores across all waves and profiles. Additionally, the magnitude of gender differences remained stable across profiles and time points, suggesting that profile membership did not influence gender differences in depressive symptoms within couples.

Together, as shown in Table 5, although both husbands and wives in Profile 2 experienced higher levels of depressive symptoms than those in Profile 1, the gender gap within couples remained stable. This stability indicates that profile membership is associated with overall levels of depressive symptoms but not relative differences between husbands and

Table 3. Fit Indices of the Latent Profile Models With Different Numbers of Solutions

K	LL	AIC	BIC	ABIC	Entropy	Smallest class %	LMRT *p* Value	BLRT *p* Value
1	−41214.346	82480.692	82627.953	82545.348				
2	**−41176.815**	**82415.631**	**82591.211**	**82492.720**	**0.613**	**18.3%**	**.0000**	**.0000**
3	−41160.886	82393.771	82597.671	82483.295	0.532	13.4%	.2750	.0000
4	−41141.308	82364.617	82596.835	82466.574	0.577	6.5%	.0159	.0000
5	−41132.621	82357.243	82617.781	82471.634	0.635	<0.1%	.0093	.0200
6	−41125.082	82352.164	82641.022	82478.989	0.587	<0.1%	.1997	.1500
7	−41116.999	82345.998	82663.175	82485.257	0.612	<0.1%	.0844	.1400

Notes: ABIC = sample size adjusted BIC; AIC = Akaike information criterion; BIC = Bayesian information criterion; BLRT = bootstrap likelihood ratio test; *K* = number of profiles; LL = log likelihood; LMRT = Lo–Mendell–Rubin likelihood ratio test. LMRT and BLRT compare the current model to a model with *k* − 1 classes. The **bolded** entries represent the fit statistics of the selected model.

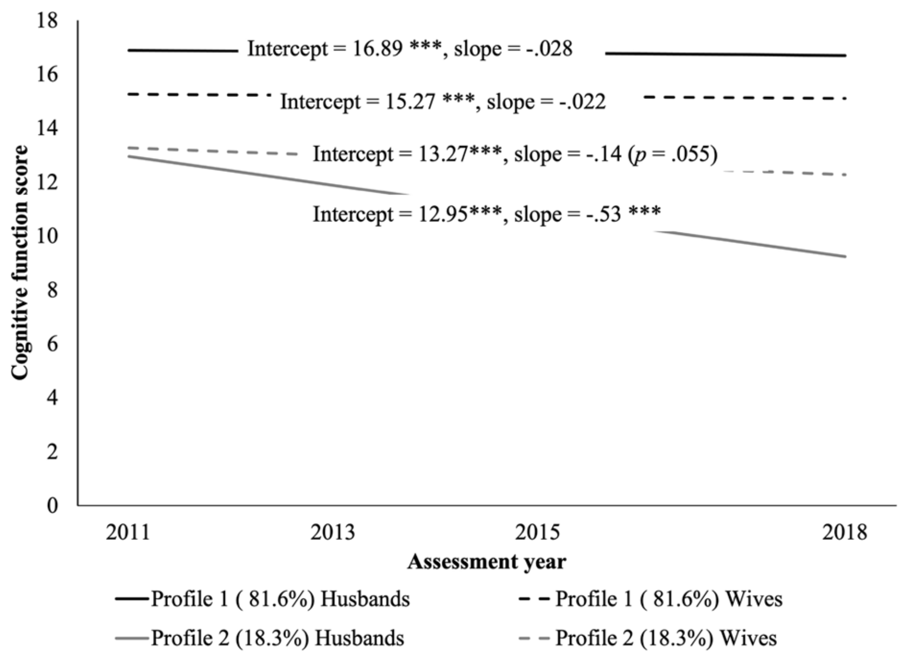

Figure 2. Visualization of the selected model.

wives. Thus, the difference in depressive symptoms between the profiles was similar for both husbands and wives.

Discussion

Using 11-year longitudinal data on 2,130 heterosexual couples from CHARLS, we considered the couple to be the unit of analysis and simultaneously characterized longitudinal changes in cognitive function for husbands and wives. Our results capture the latent dyadic profiles of husbands' and wives' cognitive function over time, uncovering couple-level patterns that would not be apparent through modeling cognitive function trajectories at the individual level, as utilized in most previous studies. The unique patterning of cognitive function within couples expands our current understanding of the interdependence of health between partners by adding new empirical evidence on cognitive function (Kiecolt-Glaser & Wilson, 2017).

For couples in Profile 1 (i.e., high stable couples with outperforming husbands), husbands' intercepts were higher than wives' intercepts, but the rate of change was not significantly different between the two partners. In other words, even though husbands had significantly higher levels of cognitive function than wives at baseline and across time, couples in this profile shared similar/concordant patterns of change in cognitive function over time. In contrast, couples in Profile 2 reported about the same initial cognitive function in 2011, indicating a similar cognitive function between the two partners when they joined the study. However, husbands experienced a steeper cognitive decline than wives over the study period. Consequently, the couples in Profile 2 had an increasing intraspouse difference in cognitive function over time.

The distinctions between the two latent profiles were therefore highlighted. First, in contrast to couples in Profile 1, who reported consistent and concordant changes in cognitive function, couples in Profile 2 had discordant changes with different rates of decline between husbands and wives (husbands' steep decline resulting in a widening intracouple gap) over time. Second, the couples in Profile 1 (i.e., high stable couples with outperforming husbands) had a higher level of cognitive function than their counterparts in Profile 2 (i.e., moderate stable

Table 4. Predictors of Latent Profile Memberships (Profile 2 vs. Profile 1)

Control variables	*B*	*SE*	Odds ratio with 95% confidence interval		
			Estimation	Lower	Higher
Age_H_2011	0.20***	0.04	1.22	1.13	1.32
Age_W_2011	−0.12	0.05	0.89	0.81	0.97
Reside (0 = urban, 1 = rural)	0.93***	0.35	2.52	1.27	5.02
Income-to-need ratio across 2011–2018	−0.26	0.15	0.77	0.57	1.04
Marital length in 2011	0.03	0.03	1.03	0.97	1.10
Number of kids in 20211	−0.01	0.11	0.99	0.80	1.22
Retirement_H_2011	−0.38	0.37	0.68	0.33	1.40
Retirement_W_2011	−0.27	0.31	0.76	0.42	1.40
Self-report health_H_2011	−0.02	0.16	0.98	0.72	1.35
Self-report health_W_2011	0.23	0.17	1.26	0.91	1.74
Function limitations_H_2011	0.19*	0.09	1.21	1.02	1.43
Function limitations_W_2011	0.01	0.08	1.01	0.86	1.19
Chronic conditions_H_2011	−0.32*	0.16	0.72	0.53	1.00
Chronic conditions _W_2011	−0.14	0.14	0.87	0.66	1.14

Notes: H = husbands; W = wives. Education of husbands and wives was removed from the control variable list because of singularity issues (i.e., the variance within Profile 2 was 0, indicating that the partners had the same level of education. The pathway coefficients cannot be estimated).
*$p < .01$. ***$p < .001$ (two-tailed).

Table 5. Using Latent Profile Memberships to Predict Depressive Symptoms and Gender Differences in Depressive Symptoms (With Control Variables and Autoregressive Pathways Accounted for)

Outcomes	Profile 1		Profile 2		Profile 2 versus Profile 1	
	Estimated mean	*SE*	Estimated mean	*SE*	*t* Test	Cohen's *d*
(A) Depressive symptoms						
Depressive symptoms in 2018 (H)	6.50	0.17	8.81	0.44	4.91***	0.30
Depressive symptoms in 2018 (W)	8.56	0.20	10.86	0.52	4.17***	0.25
Depressive symptoms in 2020 (H)	6.51	0.17	9.76	0.56	5.55***	0.36
Depressive symptoms in 2020 (W)	8.97	0.20	11.92	0.68	4.17***	0.27
(B) Gender differences						
Gender differences in 2018	−2.11***	0.20	−2.15***	0.50	−0.07	−0.004
Gender differences in 2020	−2.41***	0.21	−1.96*	0.94	0.46	0.03

Notes: H = husbands, and W = Wives. Education of husbands and wives was removed from the control variable list because of singularity issues. The gender differences were calculated by subtracting wives' reports from husbands' reports.
*$p < .05$. *** $p < .001$ (two-tailed).

wives—moderate rapid decline husbands) both at baseline and across the study period. Taken together, couples in Profile 2 seemed to experience a double hazard, with lower initial cognitive function than Profile 1 and a rapid loss in cognitive function among husbands over time. As a result, husbands and wives in Profile 2 also experienced worse mental health outcomes than their counterparts in Profile 1, as evidenced by the regression results presented in Table 5. Profile membership was associated with overall levels of depressive symptoms but not relative differences between husbands and wives, suggesting that the difference in depressive symptoms between profiles was similar for husbands and wives.

Profile membership was associated with overall depressive symptom levels but not the relative difference between husbands and wives, suggesting that the difference in depressive symptoms between profiles was similar for both husbands and wives. In summary, compared to husbands and wives with stably high cognitive function and concordant changes in cognitive function over time, those whose cognitive function started low and changed differentially within the couple (i.e., husbands with a rapid loss in cognitive function) reported unfavorable mental health outcomes for both spouses. Couples with similar baseline levels and synchronized changes in cognitive function over time had beneficial mental health results.

Specific to how the double hazard may be related to husbands' and wives' worse mental health outcomes, prior studies have reported that husbands' better cognitive function can reduce subsequent cognitive decline among wives but not vice versa (Gerstorf, Hoppmann, Anstey, et al., 2009; Gerstorf, Hoppmann, Kadlec, et al., 2009). We speculate that husbands in Profile 1, whose cognitive function outperformed their wives and stayed high over time, may have more resources that could facilitate both their own and their wives' social participation, which, in turn, can guard against cognitive decline for both spouses in the long term (Gerstorf, Hoppmann, Anstey, et al., 2009). Alternatively, since the regression results revealed that husbands with more chronic conditions at baseline were more likely to be categorized in Profile 1 than in Profile 2, we postulate that middle-aged and older men with chronic illnesses are more inclined to receive support and assistance from their spouses and other family members, potentially offering them cognitive stimulation. On the other hand, when husbands experience rapid cognitive decline (those in Profile 2), wives may need to provide support and assistance with everyday tasks and renegotiate household tasks with their husbands, or even assume the caregiving role and thereby reduce their social participation, both of which can precipitate depressive symptoms (Fletcher, 2020; Gerstorf, Hoppmann, Kadlec, et al., 2009). It is also possible that observing husbands' cognitive decline and distressing experiences could elicit similar emotional reactions among wives, referred to as emotional contagion or spillover effects within couples (Kiecolt-Glaser & Wilson, 2017; Monin et al. 2017).

The finding that different rates of change in cognitive function in a couple could have adverse mental health implications for both spouses confirms our hypothesis and is especially intriguing. This finding is largely consistent with a prior study reporting that a larger discrepancy between wives' and husbands' mental health resulted in negative outcomes, including lower marital satisfaction and a higher risk of marriage dissolution (Gerstorf et al., 2013). Prior studies have also documented different rates of change over time, with older men experiencing a more rapid cognitive decline than women (McCarrey et al., 2016). It is possible that the cognitive decline of husbands may impede their capacity to offer emotional and instrumental assistance, perhaps leading to communication issues and reduced marital quality, both of which pose psychological challenges for couples (Novak et al., 2023). Alternatively, we postulate that when both partners collaborate to cope with the husband's cognitive decline and maintain balance in their marital relationship and daily responsibilities, this compensatory process may have detrimental impacts on the mental well-being of both partners over time.

Albeit outside of our main research foci, the analyses of how covariates may be related to profile membership are also noteworthy. Specifically, our results indicate that an older age of husbands and their higher functional limitations, as well as couples' residence in rural areas, increased their likelihood of being categorized in Profile 2. Possible factors underlying the male disadvantage in rural China remain unclear and call for future research.

Our study findings are subject to several limitations. First, we focused on middle-aged and older heterosexual married couples in this study. As such, the applicability of the findings to other types of partnerships, such as younger couples, same-sex couples, and nonmarital relationships (e.g., cohabitation), remains uncertain. These are notable limitations, as prior research has shown that unmarried individuals (e.g., cohabiting, divorced, and widowed) have a higher likelihood of developing dementia over a 14-year period than their married counterparts (Liu et al., 2020). Similarly, same-sex couples are at a higher risk of cognitive impairment than heterosexual couples, which may be attributed to inadequate legal and institutional safeguards (Liu et al., 2021). Second, the data used in this study were collected from Chinese couples, and as such, it is unclear whether our results could be generalizable to other sociocultural contexts. Hence, it is important to validate our findings by conducting dyadic research employing couple-level data in other countries. This is important because sociocultural contexts play a substantial role in shaping marital relationships (Dillon et al., 2015).

Third, because marital satisfaction was measured solely at one point in 2018, it was not included as a dependent variable in this study. Future studies need to investigate the relational outcomes of dyadic cognitive function trajectory memberships, considering the established link between cognitive functioning and marital quality (Gallagher & Stokes, 2021). Fourth, although we employed a longitudinal design in this study to establish temporal orders, unobserved confounders between the profiles and depressive symptoms remain possible. Moreover, reverse causation remains plausible since depression symptom trajectories in couples are reported to predict cognitive outcomes (Kong et al., 2023b).

Furthermore, as shown in the Supplementary table, the analytic sample differs from the entire CHARLS sample in multiple domains. Compared to the analytic sample, attritional participants had older age, lower education attainment, more depressive symptoms, and lower cognitive function. They also reported poorer self-rated health, more functional limitations, and a higher likelihood of residing in rural areas with lower household incomes. Consequently, our analytical sample may exhibit selection biases, such as the exclusion of individuals who underwent marital dissolution due to depression or cognitive deterioration, or those whose cognitive decline has rendered them incapable of completing the questionnaire. The results ought to be interpreted considering these limitations. Moreover, although combined in the present study, the physical and social contexts experienced by husbands and wives in midlife and later adulthood may differ significantly (e.g., spouses in their 40s and 50s may be engaged in external employment, and these circumstances could vary between partners and affect cognitive health). Such age-graded differences throughout the lifespan warrant further research.

Implications

Despite these limitations, the study findings have important implications for practice and research. Our findings indicate that conjunct changes in cognitive function at the couple level have significant implications for the mental health of both spouses, so it is important to consider the marital context (e.g., partners' cognitive function) when developing mental health interventions. Our results indicate that mental health prevention and treatment efforts may be more beneficial when targeting the couple than focusing solely on the depressed individual, especially in couples where one spouse is experiencing cognitive decline. Cognitive interventions are needed, especially for older men residing in rural areas of China. Considering the regional disparity in aging-related services and resources in China (Fang et al., 2015), especially dementia-related care, there is a pressing need to develop and evaluate targeted and innovative interventions for older men experiencing rapid cognitive decline.

It is recommended that couple-level analysis be incorporated into aging-related health research. Future studies need to examine the relational implications of different dyadic cognitive function trajectories using data from both spouses. More dyadic health research is needed to reveal the intricate relational processes underlying health. Furthermore, this study focused on spousal dyads due to the constraints of the dataset, and future dyadic studies involving other types of family relationships (e.g., parents and adult children) are needed. The mechanisms underlying the rapid cognitive decline among husbands in Profile 2 and how wives collaboratively cope with their husbands in this situation remain unclear and call for future research using more detailed and targeted datasets.

Conclusion

The cognitive functions of most couples are concordant over time. The rapid deterioration of husbands' cognitive function and the resulting increase in the cognitive gap between partners have a detrimental impact on the mental well-being of both spouses. Our results demonstrate the effectiveness of using a dyadic modeling technique in investigating the developmental trajectories of cognitive functioning among married couples in middle and later life. Additionally, our findings enhance understanding of how the marital context shapes the cognitive function and mental health of both spouses.

Supplementary Material

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

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Conflict of Interest

None.

Data Availability

This study was not preregistered. The data used in this study were obtained from the China Health and Retirement Longitudinal Study (CHARLS), an openly accessible dataset. The official website of CHARLS is https://charls.pku.edu.cn/en/.

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