Dynamic Links of Cognitive Functioning Among Married Couples: Longitudinal Evidence From the Australian Longitudinal Study of Ageing

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Development does not take place in isolation; close others form an important dyad for exploring interrelationships. To examine spousal interrelations in level and change of cognitive functioning in old age, the authors applied dynamic models to 11-year longitudinal data of, initially, 304 married couples from the Australian Longitudinal Study of Ageing (aged 64–98 years at Time 1; M = 76 years). Findings revealed that perceptual speed for husbands predicted subsequent perceptual speed decline for wives (time lags of 1 year). There was little evidence for the opposite unidirectional effect or a bidirectional association between husbands and wives. Potential covariates (age, education, medical conditions, functional limitations, and depressive symptoms) did not account for differential lead–lag associations. A similar, though less pronounced, pattern was found for memory, which held except when functional limitations were controlled. Findings suggest that late-life cognitive development is not solely a product of intraindividual resources and are consistent with conceptual notions that development actively influences, and is influenced by, contextual factors such as close relationships. The authors discuss possible underlying mechanisms and further steps to substantiate the findings.

Keywords: couples, dyads, perceptual speed, dynamic modeling, growth curve modeling

Lifespan psychological research has long proposed that individual development does not take place in isolation but is embedded in a social context (M. M. Baltes & Carstensen, 1999; P. B. Baltes & Staudinger, 1996; Bronfenbrenner, 1979; Cairns, Elder, & Costello, 1996; Zajonc, Markus, & Markus, 1979). Marriage partners who share many life experiences exemplify one interpersonal developmental context (Antonucci & Akiyama, 1991; Lang, 2001; Meegan & Berg, 2002). Consistent with these notions, cross-sectional studies provide some evidence that levels of functioning in one or more cognitive abilities are associated between spouses (Dufouil & Alperovitch, 2000; Gruber-Baldini, Schaie, & Willis, 1995; Ko, Berg, Butner, Uchino, & Smith, 2007). However, it is an open question whether and how cognitive functioning of one spouse may affect cognitive change in the other spouse over time. By applying dynamic models to 11-year longitudinal data of married couples from the Australian Longitudinal Study of Ageing (ALSA; Luszcz et al., 2007), we (a) examine whether time-lagged spousal interrelations exist in cognitive functioning and change in old age, (b) test the directionality of such interrelations (e.g., whether the effects are bidirectional or asymmetrical in nature with one partner preceding change in the other partner), and (c) address whether age, education, medical conditions, functional limitations, and depressive symptoms alter interrelations in levels and change of cognitive functioning in elderly spouses.

Married couples form a very special, naturally occurring dyad in old age. Spouses are typically very close and become even more central in each other’s life in old age (Antonucci, 2001; Lang, 2001). Specifically, older couples share a long history of joint experiences typically originating from several decades of life together (Dixon, 1999; Meegan & Berg, 2002). Drawing from an in-depth knowledge of each other’s strengths and weaknesses, elderly spouses who collaborate on cognitive tasks achieve better outcomes than in either individual settings or when collaborating with...
a same-age stranger (Dixon & Gould, 1998; Margrett & Marsiske, 1999). It may be that part of this advantage is a reflection of interlinking (coupling) of basic cognitive processes of the pair.

Despite the potential of spousal interrelations for cognitive tasks, elderly couples also face important challenges whose outcomes may not be restricted to an individual spouse but extend to their partner as well. For example, interspousal differences in age-related declines in cognitive functioning may require tasks to be reallocated. In this case, one spouse may take over tasks from the other spouse and, in the process of doing so, learn new skills. If one spouse is frankly cognitively impaired, the other spouse may ultimately be placed in the role of a caregiver. These theoretical expectations map onto cross-sectional findings from elderly couples that report spousal interrelations in cognitive functioning concerning psychomotor speed, memory, and vocabulary abilities (Dufouil & Alperovitch, 2000; Ko et al., 2007). Little is known, however, about dyadic interrelations of age-related cognitive change trajectories between marital partners in old and advanced old age. Addressing spousal dynamics as they unfold over time is central toward better understanding possible mechanisms underlying previously reported findings on spousal interrelations in cognition.

Reports from the Seattle Longitudinal Study, for example, provide initial evidence for interrelations between marital partners’ cognitive functioning and change over time. Specifically, Gruber-Baldini et al. (1995) reported that husbands’ performance on an inductive-reasoning task predicted their wives’ inductive-reasoning performance some 7 years later but not vice versa. This finding suggests that spousal interdependencies in cognition may not necessarily be symmetric between partners. Rather, cognition seems to be asymmetrically linked between spouses, a finding that corresponds to other domains of functioning such as affective transmissions. Specifically, for the affective domain it has been argued that unidirectional predictive effects of husbands for wives may occur because wives seem to be more responsive to their husbands (i.e., have more “permeable boundaries”) than husbands are to their wives. In addition, men often have more power in a relationship than women, which also could result in husbands exerting a stronger influence on wives’ functioning than the other way around (Larson & Almeida, 1999). Hence, past research on spousal dynamics speaks to unidirectional effects from husbands to wives.

Interpretation of spousal effects may be informed by the evaluation of additional third variables that may influence spousal relationships and cognition. For this reason, the present study includes a number of third-variable factors. Specifically, our models will account for the effects of age, level of education, medical conditions, functional limitations, and depressive symptoms because we want to make sure that our findings do not simply reflect well-documented gender differences in (or direct effects of) these additional variables, which are all linked to cognition (Anstey & Christensen, 2000; Bäckman, Small, Wahlin, & Larsson, 2000; La Rue, Swan, & Carmelli, 1995; Seeman et al., 2005; Verhaeghen, Borchelt, & Smith, 2003; Wetherell, Reynolds, Gatz, & Pedersen, 2002).

To examine the possible time-ordered nature of age-related cognitive changes between spouses, we use the bivariate dual change score model (BDCSM; McArdle & Hamagami, 2001). The BDCSM has successfully been applied to articulate and empirically test developmental and aging hypotheses regarding dynamic cross-variable associations of fluid and crystallized abilities (Ferrer & McArdle, 2004; Ferrer et al., 2007; Ghisletta & Lindenberger, 2003, 2005), as well as dynamic linkages between facets of cognitive abilities and various types of activities (Ghisletta & de Ribaupierre, 2005; Lövdén, Ghisletta, & Lindenberger, 2005; Small, Dixon, McArdle, & Grimm, 2008), brain structure (McArdle et al., 2004), and well-being (Gerstorf, Lövdén, Röcke, Smith, & Lindenberger, 2007). This past work has been based on samples of unrelated individuals. Rather than examine dynamic associations between two discrete domains of functioning in unrelated individuals, the current study examines dynamic associations between two spouses by treating the couple as the unit of analysis and considering potential temporal lead–lag dynamics between cognitive functioning and change of each spouse (see also Gerstorf, Hoppmann, Kadlec, & McArdle, 2008; Hamagami, McArdle, & Fisher, 2006; McArdle, Hamagami, Kadlec, & Fisher, 2007). To clarify our reporting of findings, we borrow terminology from the dyadic literature (Cook & Kenny, 2005) and refer to associations and temporal sequencing of an individual’s characteristics with his or her own score on a given variable as actor effects (i.e., intraspouse effects) and with the partner’s score on a given variable as partner effects (i.e., across-spouse effects). Because marital partners are distinguishable, we model gender-specific actor and partner effects and test whether similar relationships emerge in husbands and wives.

The present study examines spousal interrelations in cognitive functioning in old and advanced old age. The main focus is on two key abilities. First, we consider perceptual speed, which is highly reliable and sensitive to change throughout adulthood (Anstey, Hofer, & Luszcz, 2003; Salthouse, 2004) and, as a cognitive primitive, is conceptually closer to a resource than other abilities (Luszcz & Bryan, 1999). Second, as a major concern about aging, we examine an indicator of incidental memory that requires deliberate implementation of retrieval strategies (Bryan & Luszcz, 2000) and has been shown in the ALSA to reflect gender differences (Luszcz, Bryan, & Kent, 1997) and to decline over a period of 8 years (Anstey, Hofer, & Luszcz, 2003). We simultaneously model 11-year longitudinal changes in cognition among wives and husbands and test hypotheses about the nature of their dynamic interrelationship over time. This allows us to examine, for example, whether levels of perceptual speed (or memory) of wives precede subsequent change in perceptual speed (or memory) of husbands or whether it is the level of perceptual speed (or memory) among husbands that predicts subsequent change in perceptual speed (or memory) among wives. We also investigate bidirectional accounts specifying that both lead–lag couple dynamics exist and covary out potential effects of age, level of education, medical conditions, functional limitations, and self-reported depressive symptoms of both partners.

Method

We applied a BDCSM to four waves of 11-year longitudinal data from 304 initially married couples in the ALSA. Descriptions of the larger ALSA study, its design, participants, variables, and assessment procedures are published in Andrews et al. (2002) and Luszcz et al. (1997, 2007). Select details relevant to the present study are presented below.
Participants and Procedure

To recruit the ALSA sample, the South Australian electoral roll was used as a sampling frame to identify households with residents age 70 years and older (Hugo, Healy, & Luszcz, 1987). From these households, randomly sampled individuals were asked to participate in the ALSA, as were spouses over age 65. The baseline ALSA sample \( (N = 2,087; 55\% \text{ response rate}) \) was stratified by age and sex into four 5-year cohorts (70–74 years, 75–79 years, 80–84 years, and 85-plus years) with men and those over age 85 being oversampled.

For the current study, we included all couples with data on the perceptual speed variables at baseline assessment \( (N = 304 \text{ couples or 608 participants}) \). On average, these couples had been married for 45.90 years \( (SD = 11.04; 1–65 \text{ years}) \) and had 2.72 children \( (SD = 1.48) \). On a 5-point Likert-scale, both partners reported high satisfaction with their marriage (wives: \( M = 1.71, SD = 0.81 \); husbands: \( M = 1.56, SD = 0.69 \)) and family life (wives: \( M = 1.89, SD = 0.78 \); husbands: \( M = 1.94, SD = 0.78 \)) and slightly less satisfaction with their friendships (wives: \( M = 2.26, SD = 0.73 \); husbands: \( M = 2.42, SD = 0.71 \)). To address questions of selectivity, we compared these couples with the remaining 1,479 participants from the total ALSA sample. Differences were not found in number of medical conditions \( (p > .10) \), but participants in our ALSA couple subsample were younger, a reflection of the sample selection strategy \( ^{1} \) (M = 75.71, SD = 5.44 vs. M = 79.17, SD = 6.89), \( F(1, 2085) = 122.10, p < .001 \); were more educated (50% vs. 42%), \( \chi^2(1, N = 2087) = 11.07, p < .01 \); reported fewer depressive symptoms (M = 6.91, SD = 6.49 vs. M = 8.78, SD = 7.72), \( F(1, 1991) = 26.99, p < .001 \), and functional limitations (M = 1.46, SD = 1.81 vs. M = 2.05, SD = 2.18), \( F(1, 2107) = 34.20, p < .001 \); and performed better on the Digit Symbol Substitution task \( (M = 30.95, SD = 10.89 \text{ vs. } M = 27.47, SD = 11.13), F(1, 1241) = 31.00, p < .001 \), and on the memory task \( (M = 6.39, SD = 1.91 \text{ vs. } M = 5.98, SD = 2.19), F(1, 1248) = 12.55, p < .001 \).

Trained research assistants and medical personnel collected all data in 1.5- to 2-hr sessions at participants’ homes (primarily private households with less than 2% in residential facilities) in individual face-to-face sessions. Over time, the same versions of the tests were administered. We used couple data from four waves of longitudinal assessments spanning 11 years: baseline assessment or Time 1 (T1) in 1992–93 \( (n_{\text{wives}} = 304, n_{\text{husbands}} = 304) \), Time 3 (T3) in 1994–95 \( (n_{\text{wives}} = 230, n_{\text{husbands}} = 217) \), Time 6 (T6) in 2000–2001 \( (n_{\text{wives}} = 120, n_{\text{husbands}} = 78) \), and Time 7 (T7) in 2003–4 \( (n_{\text{wives}} = 103, n_{\text{husbands}} = 54) \). Assessments at waves Time 2, Time 4, and Time 5 did not provide any cognitive data and were thus not included here. T3 occurred an average of 2.00 years \( (SD = 0.26); T6; 7.97 \text{ years } (SD = 0.31); \) and T7, 11.06 years \( (SD = 0.35) \) after T1. Of the 532 couple sample participants who survived to T3, 447 or 84% provided valid cognitive data at T3. As one would expect from the age differences, mortality rates across the same period were consistently lower for the couple sample compared with the residual sample of 1,479 participants (T3: 13% vs. 20%; T6: 39% vs. 56%; T7: 49% vs. 67%). On average, wives were followed over 5.42 years \( (SD = 4.64) \) and husbands for 3.87 years \( (SD = 4.09) \).

Measures

Perceptual speed was assessed with the Digit Symbol Substitution subscale of the Wechsler Adult Intelligence Scale–Revised (Wechsler, 1981), at T1, T3, T6, and T7. Participants substituted symbols corresponding to the numbers 1–9 as rapidly as possible into a randomly ordered array of 93 digits. Symbols were presented throughout the task. We used the correct substitutions in 90 s.

Memory was indexed by a measure of incidental immediate recall, computed as the total number of symbols recalled from the Digit Symbol Substitution test. Participants were given a recall sheet with the numbers 1–9 minus the symbols and asked to draw as many of the corresponding symbols as they could remember.

To facilitate the interpretation of our findings, we covaried the effects of age, education, medical conditions, functional limitations, and self-reported depressive symptoms of both partners. All covariates were assessed at baseline and treated as time invariant. We centered chronological age separately for both partners at their respective sample average (wives = 74 years; husbands = 77 years). Years of education were dichotomized contrasting participants who left school at age 15-plus (higher education) with those who left under age 15. Medical conditions were self-reports of the number of current chronic medical conditions from a comprehensive list of 61 (e.g., stroke, diabetes, arthritis). Functional limitations were measured by responses to two Rosow and Breslau (1966) mobility items and to five Nagi (1976) disability items.\(^{2}\) If participants had any degree of difficulty with these seven items, they received a score of 1; these were summed, so that higher scores indicate more functional limitations. For depressive symptoms, the Center for Epidemiological Studies–Depression scale (Radloff, 1977) was used; 20 items asked participants how often over the last week they had felt symptoms such as lack of energy or sad feelings.

Data Preparation

Scores for both partners’ cognitive measures were standardized to a T metric \( (M = 50, SD = 10) \), with the T1 ALSA couple sample of 608 participants providing the reference. This transformation ensured a common metric while maintaining the psychometric properties of the scores and the longitudinal changes in means and variances. No data imputation procedure was applied. Wives contributed a total of 759 longitudinal observations over an average of 2.82 years \( (SD = 3.28) \); husbands contributed a total of 655 longitudinal observations over an average of 2.52 years \( (SD = 3.53) \).

Table 1 presents the age at assessment as well as means and standard deviations for the perceptual speed and memory measures along with the covariates, separately for wives and husbands. Participants were tested, on average, in their late 70s and early 80s.

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1 That is, because 70-plus-year-old persons were targeted as participants and then their spouses were invited if they were 65 years of age or older, the average age of the couple sample is by definition younger.

2 The Rosow and Breslau (1966) items refer to level of difficulty in performing five tasks: pushing or pulling large objects, stooping or crouching or kneeling, lifting or carrying 10 pounds, reaching or extending arms, and writing or handling small objects. Similarly, Nagi (1976) items asked whether participants were able to walk up and down a flight of stairs and walk half a mile without help. Responses could range from 1 (no difficulty) to 5 (just unable to do it).
Wives were approximately 3 years younger than their husbands, 74.07 vs. 77.34 years, $F(1, 606) / H_{11005}^{0.36}, p < .001$, whereas no differences were found in education, medical conditions, functional limitations, and the number of depressive symptoms ($p > .10$). We also found that over time the means for some cognitive measures increase, partially owing to selective longitudinal attrition (Anstey & Luszcz, 2002); however, the magnitude of between-person differences is not differentially affected. Implications of nonrandom attrition for the interpretability of the results obtained in this study are addressed in the Discussion section.

### Statistical Procedures

A BDCSM combines properties of the latent growth curve model (e.g., Bryk & Raudenbush, 1992; Meredith & Tisak, 1990) and the cross-lagged regressions approach (e.g., Rogosa, 1980). Resembling the latent growth curve models, the BDCSM estimates latent intercept and slope factors for a given variable at the population level that are unbiased from residual error terms, which are estimated simultaneously and separately. Extending the typical latent growth curve model, the BDCSM in addition allows estimating time-lagged relations between states on a given variable and the reliable, error-free portion of subsequent change on another variable. Unlike typical cross-lagged correlations between variables, the BDCSM allows both adjusting for unequal reliabilities of the variables and separating dynamic changes within variables from lead–lag relations across variables (cf. Gerstorf et al., 2007).

A graphical representation of the BDCSM for a system of two variables $X$ and $Y$ is given in Figure 1. For the purpose of our analyses, $X$ represents wives’ scores and $Y$ represents husbands’ scores. The diagram shows observed (manifest) variables as squares, unobserved (latent) variables as circles, and the required constant as a triangle, as well as fixed model parameters as one-headed arrows and random parameters as two-headed arrows. Unlabeled paths are fixed to 1. The separately estimated error terms ($e_x, e_y$) are assumed to be normally distributed with a mean of zero and a time-invariant variance and to be uncorrelated with all other components except with the error term of the spouse ($e_{x,Y}$). The observed variables $x[0], x[1], x[t − 1]$, and $x[t]$ represent the various assessments of construct $X$, whereas the observed variables $y[0], y[1], y[t − 1]$, and $y[t]$ represent the various assessments of construct $Y$. The scores $x[t]$ (or $y[t]$) are defined as the unit-weighted sum of the latent score at $x[t − 1]$ (or $y[t − 1]$), plus the latent difference score $\Delta x[t]$ (or $\Delta y[t]$), so that the latent difference scores represent the latent, reliable, change score between $x[t − 1]$ and $x[t]$ (or $y[t − 1]$ and $y[t]$; McArdle & Nesselroade, 1994; cf. Gerstorf et al., 2007). The intercept $X_0$ and $Y_0$ (i.e., an individual’s score at $T_1$) and slope factors $X_S$ and $Y_S$ (i.e., an individual’s linear 1-year change scores) are supposed to account for the time series information of both variables $X$ and $Y$; intercepts and slopes are estimated at the population level ($\mu_{x,0}; \mu_{x,S}; \mu_{y,0}; \mu_{y,S}$), and they are allowed to vary ($\sigma_{x,0}; \sigma_{x,S}; \sigma_{y,0}; \sigma_{y,S}$) and covary ($\rho_{x,y,0}; \rho_{x,y,S}; \rho_{x,y,S}; \rho_{y,y,S}; \rho_{y,y,y}$).

The slope factors $X_S$ and $Y_S$ represent linear change that relates to the latent difference scores $\Delta x[t]$ and $\Delta y[t]$ with a constant loading of 1. As an extension of typical linear latent growth curve models, the difference scores $\Delta x[t]$ and $\Delta y[t]$ are defined as the unit-weighted sum of the linear component of change within a given variable plus two additional influences. First is the auto-proportion parameter (e.g., $\beta_x$) indicating the effect that level of functioning on one variable at time $t − 1$ (e.g., $X$) has on subsequent change between times $t − 1$ and $t$ of this variable. Second,
an intervariable cross-lagged dynamics parameter $\gamma_{xy}$ (or $\gamma_{yx}$) is estimated that represents the effect of variable $X$ (or $Y$) at time $t$ on subsequent change in the other variable $Y$ (or $X$) between times $t-1$ and $t$. Both $\beta$s and $\gamma$s are usually assumed time invariant. With $\beta$s and $\gamma$s set to zero, the BDCSM is equivalent to a (bivariate) linear latent growth curve model (cf. Gerstorf et al., 2007). A more detailed description of the BDCSM and its assumptions can be found elsewhere (e.g., Ferrer & McArdle, 2004; McArdle & Hamagami, 2001).

The major empirical interest of this study is in the intervariable, cross-lagged coupling or dynamics parameters. Specifically, implementing a BDCSM allows for a direct empirical comparison of competing substantive hypotheses about dynamic effects of wives’ perceptual speed on subsequent change in perceptual speed among husbands ($\gamma_{\text{wives} \rightarrow \text{husbands}}$) and, conversely, of husbands’ perceptual speed on subsequent change in perceptual speed among wives ($\gamma_{\text{husbands} \rightarrow \text{wives}}$). Because of the age- and education-heterogeneous nature of our sample, all models reported include age and education of both partners as covariates to adjust otherwise inflated covariances among variables owing to their common association with chronological age and education. In subsequent analyses, we additionally include medical conditions and depressive symptoms scores of both partners as further covariates. The dynamics parameters reported are thus statistically adjusted for the nonlinear change component of the auto-proportion parameters as well as for age and education of both spouses. In total, this BDCSM estimated 51 parameters, namely, two times seven parameters within each of the two-time series plus four cross-variable intercorrelations between wives and husbands, one covariance of time-invariant residual terms between wives and husbands, and two dynamics parameters between the time series, as well as a total of 30 parameters for age and education of both wives and husbands.

To directly test the opposing hypotheses of couple dynamics, we compare the goodness-of-fit indices of five statistically nested models (cf. Gerstorf et al., 2007). Specifically, a model that freely estimated both cross-lagged dynamics parameters $\gamma_{\text{wives} \rightarrow \text{husbands}}$ and $\gamma_{\text{husbands} \rightarrow \text{wives}}$ was referred to as the Full Dynamics model; this model was the least parsimonious of the models estimated and thus served as a reference. The other four estimated models are
nested under the Full Dynamics model. In a second model, Dynamics $\gamma_{\text{wives}} \rightarrow \text{husbands} = 0$, the dynamics from perceptual speed of wives on change in perceptual speed among husbands were set to zero, whereas the potentially predictive effects of husbands for subsequent change among wives were freely estimated. If this model was found to show a similarly good fit to the data compared with the less parsimonious Full Dynamics model, then we can reject the unidirectional hypothesis that perceptual speed among wives precedes change in perceptual speed among husbands. In our third model, Dynamics $\gamma_{\text{husbands}} \rightarrow \text{wives} = 0$, the dynamics from perceptual speed among husbands on change in perceptual speed among wives was set to zero, whereas the dynamics from wives on change in husbands was estimated. If this model was found to reveal a significant loss in goodness-of-fit statistics compared with the Full Dynamics model, then we cannot reject the unidirectional account that perceptual speed of husbands precedes change in perceptual speed of wives. The fourth model specified, Equal Dynamics, represents one operational definition of a bidirectional account in that both dynamics parameters $\gamma_{\text{wives}} \rightarrow \text{husbands}$ and $\gamma_{\text{husbands}} \rightarrow \text{wives}$ are estimated and set to be of equal size. The fifth model, No Dynamics, specifies that neither of the two dynamics parameters exists by setting both $\gamma_{\text{wives}} \rightarrow \text{husbands}$ and $\gamma_{\text{husbands}} \rightarrow \text{wives}$ at zero. If Model 4 or Model 5 were to provide a worse description of the data compared with the Full Dynamics model, then the hypothesis cannot be rejected that the dynamics parameters are of unequal size or that spousal dynamics exist between wives and husbands, respectively.3

Models were fit to the data with Mplus (Muthén & Muthén, 2006). We applied full-information maximum likelihood estimation algorithms to all data points available, which allowed treating incomplete data as missing at random (Little & Rubin, 1987) and adjusting for unbalanced data structures (Singer, 1998).

Results

Before examining time-related changes in the two aspects of cognitive functioning among wives and husbands, we established that there was substantial between-persons and within-person variance in the data, justifying the use of the BDSCM to describe these changes. The intraclass correlation for perceptual speed, as computed with a random intercept-only model, was .54 for wives and .68 for husbands. In other words, 54% of the total variation among wives and 68% of the total variation among husbands was between-persons variance, with the remainder (wives: 46%; husbands: 32%) being within-person variation. Similarly, our measure of memory revealed that 47% of the variation among wives and 51% of the variation among husbands was within persons.

Differential Spousal Dynamics in Cognitive Functioning

The upper rows in Table 2 contain various goodness-of-fit indices used to compare the age- and education-adjusted models (comparison of models adjusted for age, education, medical conditions, functional limitations, and depressive symptoms of both spouses are also included and discussed later). The difference in chi-square statistics in the third column, for example, indicates that not allowing for lagged effects from perceptual speed of wives on changes in perceptual speed of husbands (Dynamics $\gamma_{\text{wives}} \rightarrow \text{husbands} = 0$) was associated with a statistically significant but very small loss in fit, $\Delta\chi^2(1) = 7.53, p < .05$, whereas not allowing for lagged effects from husbands’ perceptual speed on changes in perceptual speed of wives (Dynamics $\gamma_{\text{husbands}} \rightarrow \text{wives} = 0$) resulted in a highly significant and substantial loss in fit relative to the Full Dynamics model, $\Delta\chi^2(1) = 60.72, p < .001$. In addition, both the Equal Dynamics model, $\Delta\chi^2(1) = 43.85, p < .001$, and the No Dynamics model, $\Delta\chi^2(2) = 61.27, p < .001$, described the data less precisely than the Full Dynamics model, suggesting that we can accept neither of the two models. Considering the two other fit indices reported in Table 2 provided a similar pattern of results in that few differences were found between the Full Dynamics model and the Dynamics $\gamma_{\text{wives}} \rightarrow \text{husbands} = 0$ model with less goodness of fit for the three other models (i.e., higher root-mean-square error of approximation and lower comparative fit index). In sum, nested model comparisons of 11-year longitudinal ALSA data indicate that husbands’ perceptual speed precedes change in perceptual speed among wives. In contrast, we found little support for hypotheses proposing a preceding role of wives’ perceptual speed for change in husbands’ perceptual speed, a bidirectional couple dynamics, or that time-lagged spousal dynamics do not exist.

Differential Magnitude of Spousal Dynamics in Perceptual Speed

To follow up on our findings for perceptual speed, we first illustrate the differential magnitude of the cross-lagged spousal effects by showing how these dynamics parameters are embedded in other components of change. In a second step, we then demonstrate how the change trajectories for one partner are differentially affected by the dynamics parameter of the other partner.

Figure 2 provides a graphical example of the conjoint product of the various components of change modeled by the BDSCM (i.e., linear change, auto-proportion parameter, dynamics parameter, and effects of the covariates). Specifically, the figure shows model-implied mean longitudinal trajectories from the Full Dynamics model for perceptual speed of both wives and husbands, as produced by the formulas $x[t] = 1 \times X_s + (1 + \beta_x) \times x[t-1] + \gamma_{x,y} \times y[t-1]$ and $y[t] = 1 \times Y_s + (1 + \beta_y) \times y[t-1] + \gamma_{x,y} \times x[t-1]$ when applied for participants of average age and education. For $x[1]$ and $y[1]$, the mean equals $x_0$ and $y_0$, respectively. Figure 2 illustrates that perceptual speed (after having been residualized for the effects of age and education) for both wives and husbands declined (about 5 T score units) in the overall sample over the 11-year study period.

To better understand the differential magnitude of the dynamics parameters and their effects over time, we varied the initial sample means for one partner by half a standard deviation (i.e., 5 T score units) while keeping the initial sample means for the other partner constant. Specifically, Figure 3A shows model-implied change over

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3 Following applications of the BDSCM by McArdle (e.g., Ferrer & McArdle, 2004; Ferrer et al., 2007) and others (e.g., Ghisletta & Lindenberger, 2003, 2005), we have assured an equal-interval approach of approximately 1-year in-between occasions by modeling unmeasured “node” variables added to account for occasions on which a given variable was not assessed. Such an equal-interval approach guarantees time-invariant scaling of all parameters and thus simplifies the estimation and interpretation of model parameters.
11 years in the hypothetical case that all wives showed similar performance on the perceptual speed measure at T1, but their husbands differed in their initial levels of perceptual speed. As is evident from these model-implied changes as a function of husbands’ perceptual speed performance, the change trajectories over time considerably differ from one another: Wives with cognitively fit husbands (husbandsT1 < 0.5 SD) showed relatively shallower cognitive decline, whereas wives with cognitively less fit husbands (husbandsT1 > 0.5 SD) showed relatively steep perceptual speed decline. We note that spousal effects appear early rather than late in the time series. Conversely, Figure 3B shows model-implied change in perceptual speed of husbands as a function of wives’ perceptual speed by varying the initial sample means for wives’ perceptual speed by 5 T score units but keeping constant the initial level for perceptual speed of husbands. In contrast to the fanning-out effect shown in Figure 3A, model-implied change as a function of wives’ perceptual speed resulted in very minor differences in change trajectories for husbands’ perceptual speed. Figures 3A and 3B thus clearly illustrate the differential magnitude of spousal dynamics.

### Spousal Dynamics in Perceptual Speed: The Role of Medical Conditions, Functional Limitations, and Depressive Symptoms

In a final set of analyses, we explored whether individual differences in medical conditions, functional limitations, and depressive symptoms may account for the spousal dynamics in cognitive functioning and change. We included these measures as time-invariant covariates of the latent factors for intercept and change. Thus, the dynamics parameters along with all other model parameters are residualized not only for age and education but also for first-occasion individual differences in medical conditions, functional limitations, and depressive symptoms for both wives and husbands.

Controlling for these additional covariates did not substantially alter the dynamic structure reported above. As the lower rows of Table 2 indicate, the Dynamics γwives → husbands = 0 model again resulted in significant but minor loss of fit to the data, Δχ²(1) = 7.06, p < .05, whereas all other models resulted in a substantial loss and are statistically rejected compared with the Full Dynamics model: Dynamics γhusbands → wives = 0, Δχ²(1) = 56.97, p < .001; Equal Dynamics, Δχ²(1) = 42.17, p < .001; No Dynamics, Δχ²(2) = 57.25, p < .001.

Parameter estimates and their standard errors from the Full Dynamics model that includes age, education, medical conditions, functional limitations, and depressive symptoms of both partners as time-invariant covariates are presented in Table 3. Consistent with the above results for the age- and education-adjusted models, Table 3 shows that the cross-lagged dynamic effect γwives → husbands was statistically significant but small (−0.19, SE = 0.09, p < .05), whereas the dynamic effect from husbands on change among wives, γhusbands → wives, was highly statistically significant and substantially larger (0.77, SE = 0.18, p < .001). Table 3 also presents the covariances among the intercept and slope factors at both the actor and the partner level. For example, the covariance between perceptual speed performances of husbands and wives (r = 11.82, SE = 4.73, or in correlation units r = .20) was statistically significant but relatively low. This provides another rationale for heuristically varying initial levels for one partner while keeping

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### Table 2

**Goodness-of-Fit Model Comparison Between Alternative Bivariate Models of Spousal Dynamics on Perceptual Speed, Using the 11-Year Australian Longitudinal Study of Ageing Sample**

<table>
<thead>
<tr>
<th>Model</th>
<th>χ² (df)</th>
<th>Δχ² (df)</th>
<th>RMSEA</th>
<th>CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unidirectional</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamics γwives → husbands = 0</td>
<td>96.93 (40)</td>
<td>7.53 (1)**</td>
<td>.068</td>
<td>.928</td>
</tr>
<tr>
<td>Dynamics γhusbands → wives = 0</td>
<td>150.12 (40)</td>
<td>60.72 (1)**</td>
<td>.095</td>
<td>.861</td>
</tr>
<tr>
<td><strong>Bidirectional</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal dynamics</td>
<td>133.25 (40)</td>
<td>43.85 (1)**</td>
<td>.088</td>
<td>.882</td>
</tr>
<tr>
<td>Full dynamics</td>
<td>89.40 (39)</td>
<td>—</td>
<td>.065</td>
<td>.936</td>
</tr>
<tr>
<td>No dynamics</td>
<td>150.67 (41)</td>
<td>61.27 (2)**</td>
<td>.094</td>
<td>.861</td>
</tr>
</tbody>
</table>

**Age, education, medical conditions, functional limitations, and depressive symptoms of both partners included**

<table>
<thead>
<tr>
<th>Model</th>
<th>χ² (df)</th>
<th>Δχ² (df)</th>
<th>RMSEA</th>
<th>CFI</th>
</tr>
</thead>
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<td><strong>Unidirectional</strong></td>
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<tr>
<td>Dynamics γwives → husbands = 0</td>
<td>137.49 (64)</td>
<td>7.06 (1)**</td>
<td>.061</td>
<td>.911</td>
</tr>
<tr>
<td>Dynamics γhusbands → wives = 0</td>
<td>187.40 (64)</td>
<td>56.97 (1)**</td>
<td>.080</td>
<td>.852</td>
</tr>
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<td><strong>Bidirectional</strong></td>
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<td></td>
</tr>
<tr>
<td>Equal dynamics</td>
<td>172.60 (64)</td>
<td>42.17 (1)**</td>
<td>.075</td>
<td>.868</td>
</tr>
<tr>
<td>Full dynamics</td>
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<td>—</td>
<td>.059</td>
<td>.918</td>
</tr>
<tr>
<td>No dynamics</td>
<td>187.68 (65)</td>
<td>57.25 (2)**</td>
<td>.079</td>
<td>.851</td>
</tr>
</tbody>
</table>

Note. N = 304. Significance refers to loss in chi-square assuming the model Full Dynamics to be correct. Dashes represent the reference model on which the difference for all other models is based. RMSEA = root-mean-square error of approximation; CFI = comparative fit index.

*p < .05. **p < .01. ***p < .001.

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4 It is an open question whether this is due to methodological reasons (e.g., attrition-imposed limitations in statistical power in later waves) or reflects a substantive phenomenon (e.g., changes in the spousal relationship dynamics).
constant initial levels for the other partner (as done in Figure 3). However, we emphasize that no single parameter should be interpreted in isolation but only conjointly with the other model parameter estimates. In line with this principle, we plotted the model-implied means (see Figures 2 and 3) that represent the dynamic systems equations as a whole. In a similar vein, we would like to highlight that covariances are part of these complex dynamic expectations (e.g., $\sigma = -39.77$ between husbands’ initial level and wives’ slope) and must not be interpreted in isolation (cf. Lövdén et al., 2005).

Table 4 reports results from analyses targeting memory—a similar, though considerably less pronounced, pattern as reported above for

![Figure 2](image_url)

**Figure 2.** Model-implied mean longitudinal change trajectories over time on perceptual speed for wives and husbands, as revealed from the bivariate dual change score model (Full Dynamics) for wives and husbands of average age and education.

![Figure 3](image_url)

**Figure 3.** Graphical illustration of the differential magnitude of dynamic partner effects between wives’ and husbands’ perceptual speed and their effects over time for wives and husbands of average age and education. The solid lines in Figure 3A represent model-implied sample means on wives’ perceptual speed from a bivariate dual change score model (Full Dynamics) for the hypothetical case that the initial sample means for husbands’ perceptual speed were varied by half a standard deviation (i.e., 5 T score units). Under the assumption of comparable wives’ perceptual speed at Time 1 (T1), wives with cognitively fit husbands (husbands$_{T1}$ +0.5 SD) showed relatively shallow perceptual speed decline, whereas those with cognitively less fit husbands (husbands$_{T1}$ −0.5 SD) showed relatively steep perceptual speed decline. In contrast, the dashed lines in Figure 3B indicate that husbands’ perceptual speed trajectories of change over time were minimally changed as a function of different initial levels of wives’ perceptual speed at T1.
perceptual speed was found. Relative to the Full Dynamics model, the No Dynamics model resulted in a significant loss of model fit, $\Delta \chi^2(1) = 8.07, p < .05$, suggesting that we can reject the null hypothesis that spousal interrelations do not exist in memory. Setting the predictive effects of wives’ memory performance for subsequent memory change among husbands to zero resulted in modest loss of model fit, $\Delta \chi^2(1) = 2.73$, compared with setting the reverse path of husbands to change among wives to zero, $\Delta \chi^2(1) = 7.44$. The general patterning was also mirrored in the direction, size, and significance of the dynamics parameters from the Full Dynamics model: $\gamma_{\text{wives} \rightarrow \text{husbands}} = 0.14, SE = 0.15, p > .10; \gamma_{\text{husbands} \rightarrow \text{wives}} = 0.23, SE = 0.08, p < .01$. These spousal interrelations were weaker for memory relative to perceptual speed with the effects of both partners’ age and education covaried. They completely vanished after additional controls were made for medical conditions, functional limitations, and depressive symptoms of both spouses. Elimination of the effects seemed to be primarily due to taking into account functional limitations, given that the difference between the No Dynamics model and the Full Dynamics model was significant when only medical conditions and depressive symptoms were added, $\Delta \chi^2(2) = 7.19, p < .001$.

In summary, our results suggest that spousal interrelations in cognitive functioning and change exist. The most persuasive evidence for such interrelations was gained in the perceptual speed domain, whereas findings in the memory domain were less consistent and less pronounced. Spousal interrelations appear to be asymmetrical, with husbands preceding subsequent change among wives.

Discussion

The major objective of the current study was to examine spousal interrelations in cognitive functioning (perceptual speed and memory) and change in old age. Applying dynamic models to 11-year longitudinal data from 304 baseline married couples in the ALSA, we found evidence for asymmetrical antecedent-consequent relations in cognitive change between spouses. Specifically, husbands’ performance on measures of perceptual speed was found to precede and predict subsequent changes in perceptual speed for wives (time lags of 1 year), whereas there was very limited evidence for the opposite unidirectional pattern or a bidirectional association between husbands and wives. Effects found for memory, showing a similar trend, were less pronounced. Perceptual speed effects were found to be robust to controls for age, education, medical conditions, functional limitations, and self-reported depressive symptoms of both partners. This was the most persuasive evidence for spousal interrelations, as asymmetric trajectories in the memory domain were less robust to the influence of covariates. We note that our study represents a first descriptive step and does not allow for causal inferences. Our findings of temporal dynamics between spouses, however, are consistent with lifespan psychological notions that individual development both actively shapes and is shaped by contextual factors such as close social relationships.

**Spousal Dynamics in Cognitive Functioning and Change in Old Age**

Our findings suggest that late-life cognitive development is not solely a product of intrapersonal resources but is closely interrelated between elderly spouses. Specifically, with the BDCSM, we were able to empirically examine whether elderly husbands’ cognitive performance precedes and predicts decline in elderly wives’ cognitive performance and to pit this empirical test against those testing several alternative hypotheses, for example, that wives’ cognitive performance precedes and predicts cognitive decline in husbands. Our findings suggest that wives are more vulnerable to spousal interrelations than husbands. However, it is possible that gender differences in the amounts of within-person variation may have been one factor contributing to our findings. Specifically, preliminary analyses revealed that wives showed more intrapersonal variation over time than husbands (46% vs. 32% of total variation was within persons), thereby potentially constraining the chances of identifying preceding effects of wives for husbands’ cognition as well. To what extent this evidence represents a sample-specific phenomenon in the ALSA or rather reflects a substantive characteristic of husbands (or men in general) should be explored in more detail in future studies.

The unidirectional pattern that we did observe for perceptual speed and the trends shown for memory is consistent with the scant extant reports from the broader couple literature. In the cognitive domain, Gruber-Baldini et al. (1995) reported cross-lagged correlations from the Seattle Longitudinal Study showing that elderly husbands’ performance on an inductive-reasoning task predicted their wives’ inductive-reasoning performance 7 years later but not vice versa. Similarly, recent 10-year analyses from the Study of Asset and Health Dynamics Among the Oldest Old revealed comparable evidence for an asymmetrical patterning such that better memory performance among husbands predicted less subsequent memory decline among wives (Gerstorf, Hoppmann, et al., 2008; for similar evidence from couples in the Alameda County Study, see Strawbridge, Wallhagen, Thai, & Shema, in press). Analogous unidirectional effects have also been observed in emotional functioning. For example, studies targeting everyday-life affective pro-

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5 In follow-up analyses, we also targeted a measure of verbal abilities, indexed by three items taken from the Similarities test of the Wechsler Adult Intelligence Scale–Revised; standard scoring was applied, so total scores could range from 0 to 6. Analyses revealed that we cannot reject the hypothesis that spousal dynamics exist between wives and husbands ($\chi^2(2) = 20.99, p < .001$). Again, the dynamics parameters were reliably different from zero for husbands ($\gamma_{\text{husbands} \rightarrow \text{wives}} = 1.54, SE = 0.78, p < .01$) but not for wives ($\gamma_{\text{wives} \rightarrow \text{husbands}} = 0.38, SE = 0.69, p > .10$). We remain cautious in interpreting these findings, however, given that verbal abilities showed very little normative change over time and interindividual differences therein.

6 In a similar vein, additional follow-up analyses that used various alternative indicators of the covariates yielded substantively the same pattern of results as reported in the text. Specifically, we have targeted (a) years of formal schooling or occupational status (for details, see McLennee, 1997) rather than the dichotomous education variable as the socioeconomic status indicator, (b) activities of daily living (Katz et al., 1963) or instrumental activities of daily living (for details, see Lawton & Brody, 1969) rather than the functional ability variable as indicator of physical functioning, and (c) separate measures of neurological conditions and cardiovascular diseases (for details, see Anstey, von Sanden, & Luszcz, 2006) rather than the overall number of chronic medical conditions as indicators of medical conditions. Our findings also remained virtually unchanged when the effects of (a) means of and differences between spouses in age and education and (b) the number of children were covaried out.
cesses among middle-aged couples suggest greater affective transmissions from husbands to wives than vice versa. Specifically, husbands’ daily negative emotions were found to predict wives’ daily negative emotions more so than wives’ emotions predicted husbands’ emotions (Larson & Almeida, 1999). Hence, the unidirectional predictive effects of husbands’ perceptual speed for changes in wives’ perceptual speed is not an isolated phenomenon but in line with other studies looking at spousal interrelations in the cognitive and emotional domain.

Clearly, much more work is required to fully understand potential underlying mechanisms. One possible explanation for our finding may be that husbands’ cognitive fitness is an indicator of differential resource status within and between couples that may moderate (e.g., slow the pace of) cognitive decline. For example, husbands with higher cognitive functioning may have accumulated important resources that benefit the couple in old age, but measures of such resources may not have been included in this study. Potential candidate factors may encompass byproducts of a demanding and successful professional career such as, more broadly, general brain reserve or, more specifically, expectancies of control or mastery that may have accumulated more so for husbands than for wives in this cohort. Such additional resources may then exert domain-generalized and gender-differential protective effects that may go beyond the immediate effects of factors such as education (Schooler & Mulatu, 2001). A second potential explanation may be that a cognitively fit husband may afford opportunities for his wife to lead an active life, for example, by engaging in social activities that challenge her cognitive abilities (for evidence from unrelated individuals, see Fratiglioni, Paillard-Borg, & Winblad, 2004; Lövdén et al., 2005; Pushkar et al., 1999). In contrast, a cognitively challenged husband may require a lifestyle in which the wife’s role is restricted to home duties, with many of her cognitive resources invested in caring for his needs. Interestingly, our results further suggest that changes in perceptual speed in old age not only rely on biological propensities but are also related to social relationships and activities (Hoppmann, Gerstorf, & Luszcz, 2004; Lövdén et al., 2005; Pushkar et al., 1999). In contrast, a cognitively challenged husband may require a lifestyle in which the wife’s role is restricted to home duties, with many of her cognitive resources invested in caring for his needs. Interestingly, our results further suggest that changes in perceptual speed in old age not only rely on biological propensities but are also related to social relationships and activities (Hoppmann, Gerstorf, & Luszcz, 2004; Lövdén et al., 2005; Pushkar et al., 1999). In contrast, a cognitively challenged husband may require a lifestyle in which the wife’s role is restricted to home duties, with many of her cognitive resources invested in caring for his needs. Interestingly, our results further suggest that changes in perceptual speed in old age not only rely on biological propensities but are also related to social relationships and activities (Hoppmann, Gerstorf, & Luszcz, 2004; Lövdén et al., 2005; Pushkar et al., 1999). In contrast, a cognitively challenged husband may require a lifestyle in which the wife’s role is restricted to home duties, with many of her cognitive resources invested in caring for his needs. Interestingly, our results further suggest that changes in perceptual speed in old age not only rely on biological propensities but are also related to social relationships and activities (Hoppmann, Gerstorf, & Luszcz, 2004; Lövdén et al., 2005; Pushkar et al., 1999).
of the need for further research to provide a better understanding of the interplay of cognitive aging and health. Hofer, 2008) of the need for further research to provide a better understanding of the interplay of cognitive aging and health.

We acknowledge that other variables not included in our models could have accounted for some of the significant effect of husbands' cognitive abilities for wives' cognitive change. Such variables include impairment in instrumental activities of daily living or engagement with community activities (Schooler & Mulatu, 2001). Specifically pinpointing issues of spousal similarities and interrelations in additional facets such as engagement in community activities, cognitive self-efficacy, experience and perception of life events, and psychosocial stressors was beyond the scope of our primarily cognitively oriented investigation, but a detailed exploration of such potentially mediating factors would be a valuable project for future research.

Methodological Considerations: A Dynamic Model of Dyadic Interrelations

The major focus of our study was on exploring whether and how time-lagged developmental sequences exist between husbands' and wives' cognitive functioning and change in old age. We have opted for a dynamic modeling tool like the BDCSM over other multivariate techniques because the latter may not sufficiently portray such dynamic characteristics (for overview, see Ferrer et al., 2007). For example, bivariate latent growth curve models typically capture static–overall change correlations, but these parameters are not indicative of any dynamic relations between variables. Compared with other dynamic methods such as cross-lagged correlations, the BDCSM overcomes some of their limitations (see Rogosa, 1980), such as accounting for differential reliabilities and stabilities of the variables examined and separating intraconstruct from interconstruct dynamics (cf. Ghisletta & Lindenberger, 2005; Lövdén et al., 2005). However, several methodological issues are noteworthy.

As is true for many other studies, the validity of our results is contingent on a number of untested statistical assumptions including ergodicity (i.e., equivalence of structural relations based on interindividual and intraindividual variance), sample homogeneity (e.g., regarding the dynamics parameters), and data missing-at-random (cf. Lövdén, Li, Shing, & Lindenberger, 2007). We acknowledge that these are strict assumptions, for which the plausibility is at best unknown (see also Lövdén et al., 2005). For example, our growth curve models produced estimates of average within-person change independent of whether or not an individual (or couple) stayed in the sample over time (i.e., missing-at-random assumption). We also acknowledge that spousal interrelations are certainly not adequately depicted with a bivariate system. Extending the dual change score model beyond the bivariate case may thus help to better understand how spousal interrelations in the cognitive domain are embedded in other complex systems of influence (e.g., emotion; Bookwala & Schulz, 1996; Moritz, Kasl, & Berkman, 1989; Tower & Kasl, 1996). Finally, if husbands and wives profited differentially from repeated test exposure over time in the ALSA, then this (rather than the mere existence of retest effects) may constitute a validity threat for our results. Modeling spousal dynamics over time in study did not allow us to directly adjust for possible gender-differential retest effects. This appears permissible, however, given that analyses specifically targeting such questions revealed that some of the cognitive tests in the ALSA show various forms of retest effects, but they were not different between men and women (Anstey, 2007).

Limitations and Outlook

Using data from the ALSA study, we found compelling evidence for differential antecedent–consequent relations between aspects of

### Table 4

**Goodness-of-Fit Model Comparison Between Alternative Bivariate Models of Spousal Dynamics on Memory, Using the 11-Year Australian Longitudinal Study of Ageing Sample**

<table>
<thead>
<tr>
<th>Model</th>
<th>Goodness-of-fit indices</th>
<th>χ² (df)</th>
<th>Δχ² (df)</th>
<th>RMSEA</th>
<th>CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unidirectional</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamics γₗwives → husbands = 0</td>
<td></td>
<td>29.22 (40)</td>
<td>2.73 (1)*</td>
<td>.000</td>
<td>1.00</td>
</tr>
<tr>
<td>Dynamics γₗhusbands → wives = 0</td>
<td></td>
<td>33.93 (40)</td>
<td>7.44 (1)**</td>
<td>.000</td>
<td>1.00</td>
</tr>
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<td><strong>Bidirectional</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal dynamics</td>
<td></td>
<td>26.73 (40)</td>
<td>0.24 (1)</td>
<td>.000</td>
<td>1.00</td>
</tr>
<tr>
<td>Full dynamics</td>
<td></td>
<td>26.49 (39)</td>
<td>—</td>
<td>.000</td>
<td>1.00</td>
</tr>
<tr>
<td>No dynamics</td>
<td></td>
<td>34.56 (41)</td>
<td>8.07 (2)*</td>
<td>.000</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Age, education, medical conditions, functional limitations, and depressive symptoms of both partners included</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Unidirectional</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamics γₗwives → husbands = 0</td>
<td></td>
<td>49.00 (64)</td>
<td>0.10 (1)</td>
<td>.000</td>
<td>1.00</td>
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<td>48.98 (64)</td>
<td>0.08 (1)</td>
<td>.000</td>
<td>1.00</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>48.93 (64)</td>
<td>0.03 (1)</td>
<td>.000</td>
<td>1.00</td>
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<tr>
<td>Full dynamics</td>
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<td>.000</td>
<td>1.00</td>
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<tr>
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<td></td>
<td>49.03 (65)</td>
<td>0.13 (2)</td>
<td>.000</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Note. N = 324. Significance refers to loss in chi-square assuming the model Full Dynamics to be correct. Dashes represent the reference model on which the difference for all other models is based. RMSEA = root-mean-square error of approximation; CFI = comparative fit index.

*p < .05. **p < .01.
married spouses' cognitive functioning and change. The present study sheds some initial light on the developmental ordering and spousal interrelations in a key psychological domain, cognitive aging, which is typically viewed as a constellation of general-purpose mechanisms for adaptation and a resource that people can draw upon in the face of obstacles (P. B. Baltes, Lindenberger, & Staudinger, 2006). However, the study of spousal interrelationships and late-life cognitive development is an emergent field of research requiring further theoretical, empirical, and methodological advances to fully model and understand the complex interplay of how contextual factors like significant others may actively shape and be shaped by developmental changes in key domains of functioning across the adult lifespan and old age (M. M. Baltes & Carstensen, 1999; P. B. Baltes & Staudinger, 1996; Bronfenbrenner, 1979; Cairns et al., 1996; Zajonc et al., 1979). Future research may benefit from specifically targeting such questions as whether preserved cognitive fitness among spouses may serve as a protective factor against wives’ cognitive decline, whether impaired cognition among husbands may act as a risk factor for cognitive decline among wives, and whether interventions targeted at wives of cognitively impaired husbands lead to improvement in wives’ cognition. From an intervention perspective, it may be important to acknowledge such spousal interrelations in central functional domains and to work toward fostering abilities and skills that promote both individual and spousal cognitive functioning. Another possible factor contributing to our findings is that differential spousal dynamics may reflect gender differences in the timing of cognitive decline with approaching death. Specifically, it is well known that older men are typically closer to death than older women (Suzman, Montan, & Willis, 1992) and cognitive level and change in old age are salient mortality predictors (Anstey, Luszcz, Giles, & Andrews, 2002; for overview, see Bäckman & MacDonald, 2006), so that cognitive decline for wives may simply set in later than for husbands, thereby accounting for any time-lagged differences observed in this study. However, follow-up analyses targeting such speculation by including distance-to-death for both wives and husbands as additional covariates yielded basically the same pattern of results as reported. This suggests that it is not merely closeness to death that accounts for our findings of wives’ cognitive change following that of husbands. We cannot rule out the further possibility, however, that the shorter follow-up period for husbands (and hence more advanced progression along their cognitive trajectory) may have limited our possibility of identifying a preceding effect of wives as well.

Although the ALSA sample was randomly selected from the electoral roll, our initial sample is likely to be higher functioning than those who did not elect to or who were unable to participate. Likewise, although our statistical techniques accounted for missing data, it is those who persisted in the study who were likely to be higher functioning, so that our results may underestimate the true extent of cognitive decline in the population. It would be intriguing to examine, for example, whether different spousal dynamics emerge when one partner experiences severe cognitive declines and the other partner transitions into the role of a caregiver (see Lyons, Zarit, Sayer, & Whitlatch, 2002). It is an open question, then, whether the declining partner benefits from the presence of a cognitively fit spouse or, conversely, whether the other partner is negatively affected by having a spouse for whom cognitive resources are taxed. It is also conceivable that the direction and size of spousal interrelations as found in this study may be conditional upon the domain of functioning investigated (cognition), the time metric examined (long-term change), the age group under study (old age), or the specific ALSA cohort and its sociocultural background. For example, recent reports on long-term change dynamics between elderly couples from the Study of Asset and Health Dynamics Among the Oldest Old suggest that wives’ depressive symptoms predicted subsequent increases in depressive symptoms among husbands but not the reverse (Gerstorf et al., 2008). It would be interesting to investigate how the reported interrelations in cognition that occurred on a scale of years translate into the daily lives of elderly spouses and how they are linked to the activities they engage in on a daily basis. Such questions could be addressed by complementing protracted longitudinal designs with daily time-sampling modules that shed light on mechanisms that unfold within the context-specific interactions and influences of couples’ natural environments (see Hoppmann & Riediger, in press; Larson & Almeida, 1999). Another promising route could be to move the study of spousal interrelations beyond the categories of gender (wives vs. husbands) toward an explicit consideration of other categorizations of spousal characteristics (e.g., labor force status: employed partner vs. unemployed partner; personality: outgoing partner vs. introverted partner).

In conclusion, long-term marital partnerships provide a rich environment for examining interrelations that go beyond the socioemotional domain. Old-age changes in basic cognitive processes also appear to be moderated by one’s partner, particularly for wives. An implication of our findings is that the magnitude of cognitive change is not solely a product of intradividual resources or well-known gender differentials in age, education, or life expectancy. Our findings speak to the important role of social relationship partners such as spouses for late-life development and thus illustrate the utility of studying more than one focal person over time to better understand late-life trajectories of change in key domains of functioning (Dixon, 1999; Hoppmann & Gerstorf, in press). Our findings imply that spousal cognitive functioning can either benefit or harm individual development.

References
Anstey, K. J. (2007, July). Demographic, health, sensorimotor and psy-


Correction to Gerstorf, Hoppmann, Anstey, and Luszcz (2009)

In the article, “Dynamic Links of Cognitive Functioning Among Married Couples: Longitudinal Evidence From the Australian Longitudinal Study of Ageing,” by Denis Gerstorf, Christiane A. Hoppmann, Kaarin J. Anstey, and Mary A. Luszcz (Psychology and Aging, 2009, Vol. 24, No. 2, pp. 296–309), an incorrect Figure 1 was printed due to an error in the production process. The correct version is presented below.

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