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# We are in this together: Dyadic patterns of self-esteem change in late-life couples

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## Abstract

Lifespan theoretical notions have long acknowledged that regulative capacities of the self are relatively robust well into old age. This general trend notwithstanding, people often differ substantially throughout life in their levels of and change trajectories in self-esteem. One prime contributing factor may be perceptions of social inclusion. Because functioning and development in many domains of life are often linked across partners, we examine whether and how self-esteem and its late-life change are intertwined between long-term married partners. To do so, we make use of six occasions over 18-year longitudinal data from 382 married couples in the Australian Longitudinal Study of Aging ( $M_{age} = 75$  years at baseline,  $SD = 5.3$ , range 65–91). Applying SEM-based continuous time panel models revealed that discrete time autoregressive effects, which capture the stability of self-esteem, were declining over time. Most important for our question, across-partner (cross-lagged) effects indicated substantial differences between spouses such that change in husbands' self-esteem predicts subsequent changes in the wives' self-esteem, but not vice versa. We discuss potential conditions and challenges of dyadic associations in how late-life self-esteem and its change are intertwined between partners.

## Keywords

continuous time modeling, dyadic (couple) models, late life, longitudinal data, self-esteem change

The importance of social relationships for the development of self-esteem has been shown in theoretical notions and empirical psychological research (as general framework, see Back et al., 2011; but also Denissen, Penke, Schmitt, & van Aken, 2008; Hutteman, Nestler, Wagner, Egloff, & Back, 2015; Leary & Baumeister, 2000; Murray, Bellavia, Feeney, Holmes, & Rose, 2001). Self-esteem, defined as the general evaluation of the self (James, 1890), has been regarded as sociometer or gauge of social belongingness (Leary & Baumeister, 2000). One of the most important social relationships is the one with one's spouse, and this appears to be particularly true for later life (Lang, Wagner, Wrzus, & Neyer, 2013). Nevertheless, earlier findings on spousal self-esteem links are inconsistent: Existing studies generally suggest that husband's and wife's levels of self-esteem are associated, but oftentimes no cross- or partner-effects are found across time (Erol & Orth, 2014; Schaffhuser, Wagner, Lüdtkke, & Allemand, 2014). One caveat of these previous studies is the focus on between-person rank-order consistencies rather than genuine within-couple dynamics (Hamaker, Kuiper, & Grasman, 2015). However, most psychological theories, such as sociometer theory, are process models of within-person dynamics (see Segal & Fraley, 2016 for a recent discussion and empirical test of the investment model). As a consequence, a thorough test of these notions requires a within-person approach. With the present article, we would thus like to push self-esteem research towards a better distinction of between-person and within-person processes. Following up on recent methodological advancements on within-person and between-person dynamics, the current article sets out to examine longitudinal dyadic self-esteem associations in later life couples using continuous time modeling (Voelkle, Oud, Davidov, & Schmidt, 2012; Voelkle & Oud, 2013) as an approach to estimate within-couple dynamics while controlling for between-couple differences. We apply these models to a longitudinal dyadic sample of

long-term spouses of the Australian Longitudinal Study of Aging (ALSA;  $N = 382$  couples).

## Spousal relationships later in life

Later in life, social network size is known to decline, but such decrements are often less pronounced for emotionally significant others (Lang & Carstensen, 2002; Wrzus, Hänel, Wagner, & Neyer, 2013). Being one of the closest interaction partners throughout the adult life (Neyer & Lang, 2003), spouses are expected to become an even closer confidant and a more frequent interaction partner in older age. This may be particularly true after retirement and the frequent loss of daily work-related routines and professional networks. In addition, long-term spouses have often shared a substantial amount of life-time with each other, and thus are in a position to draw from conjoint memories and years of interactions (Carstensen, Graff, Levenson, & Gottman, 1996; Hoppmann & Gerstorf, 2009, 2014). Also, older couples typically report fewer conflicts, appear to derive more meaning out of their spousal relationships

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(Carstensen et al., 1996), and report less psychological distress (Waite, 2003) and lower rates of illness than singles (Swanson, Belle, & Satariano, 1985). These benefits appear to be particularly pronounced in late life (Umberson, Williams, Powers, Liu, & Needham, 2006).

Based on such knowledge, developmental psychology increasingly investigates possible reciprocal relationships in older couples' development. Empirical studies indicate spousal associations in multiple domains of functioning, including well-being (Bookwala & Schulz, 1996), cognition (Gerstorf, Hoppmann, Anstey, & Luszcz, 2009), social activity (Hoppmann, Gerstorf, & Luszcz, 2008), and health (Strawbridge, Wallhagen, & Shema, 2007). In the current study, we investigate the dynamics of dyadic interrelatedness in one important indicator of psychological functioning, namely self-esteem. To this end, we focus on longer-term processes across several years and use a new methodological approach that allows us to directly model and test the presumed dyadic dynamics.

Importantly, theoretical notions suggest that interrelatedness might not be symmetric. Specifically, differences in power and emotional responsiveness could affect dyadic interrelatedness (Larson & Almeida, 1999). Accordingly, women have been shown to be more affective responsive to their husband (Larson & Almeida, 1999) and more affected by previous levels of cognitive functioning (Gruber-Baldini, Schaie, & Willis, 1995) or health (Yorgason, Almeida, Neupert, Spiro, & Hoffman, 2006). For example, a daily diary study found that when husbands reported more daily health symptoms, their wives reported higher daily negative affect, whereas the opposite was not true (Yorgason, Almeida, Neupert, Spiro, & Hoffman, 2006). In contrast, 3-year longitudinal data of long-wed couples found no cross effects, but higher life-satisfaction in wives related to higher life-satisfaction in husbands at the same time point supporting only one direction but this time from wife to husband (King, Canham, Cobb, & O'Rourke, 2016). These empirical examples illustrate the existence of gender effects but simultaneously suggest that the direction of effects has to be considered an open question.

### *Self-esteem in late life: Relationship perspective*

There is a longstanding theoretical tradition suggesting an interdependence of self-esteem and social relationships or belonging (Cooley, 1902). More recently, Leary and Baumeister (2000) have argued that self-esteem is expected to function as a monitor or sociometer of relational belongingness and thus represents a feedback for the degree of social inclusion. Accordingly, the interplay between a person and its social world constitutes a major part of how a person evaluates his/herself (James, 1890). As consequence, an individual's self-esteem should be highly responsive to social feedback. Recent empirical studies provide evidence indicating the important role of social relationships and social inclusion for self-esteem, and the evidence has been gathered across multiple study designs, including experimental designs (Thomaes et al., 2010), daily diary studies (Denissen et al., 2008), across the duration of a school year when being abroad (Hutteman et al., 2015), and for the experience of a first partnership (Lehnart, Neyer, & Eccles, 2010; Luciano & Orth, 2016; Wagner, Becker, Lütke, & Trautwein, 2015).

Focusing on a dyadic partnership perspective, self-esteem research may be clustered in two fields of research. On the one hand, a solid number of studies are looking at different facets of

self-esteem in experimental settings. These studies mostly use student and (young adult) dating couples associating higher self-esteem, with higher relationship commitment, and higher partner regard (Ford & Collins, 2010; Lin & Rusbult, 1995; Murray, Holmes, & Griffin, 2000). However, interdependencies between partners' self-esteem are typically not analyzed. On the other hand, some longitudinal studies have employed more age-diverse samples, focusing on longitudinal dyadic associations between self-esteem and relationship satisfaction (Erol & Orth, 2014; Schaffhuser et al., 2014). For example, Erol and Orth (2014) applied latent growth analyses to two age-diverse longitudinal samples. Results indicated that higher initial levels and positive change in self-esteem predicted higher levels and also change in relationship satisfaction, respectively. These associations were identical for both sexes and partially support the notion that self-esteem operates as a resource. Similarly, Schaffhuser and colleagues (2014) applied a set of Actor-Partner-Interdependence models (APIM, Kenny, Kashy, & Cook, 2006) to longitudinal data of an age-diverse couple sample, demonstrating self-esteem to be an interpersonal outcome. Shared relationship satisfaction, modeled based on perceptions of both partners, predicted self-esteem levels of both husband and wife 2 years later. However, neither of these studies focused on the actual dyadic interrelatedness of self-esteem and time-specific associations thereof. Erol and Orth (2014) tested correlations between self-esteem change in husbands and in wives, but their results are inconsistent across the two studies and, thus, inconclusive.

Based on these findings, we identified at least two limitations that should be addressed in further studies. First, previous studies largely ignore time intervals and their effect on parameters. With respect to self-esteem, several studies indicated a relative stability or trait-like structure across time (Donnellan, Kenny, Trzesniewski, Lucas, & Conger, 2012; Wagner, Lütke, & Trautwein, 2016). However, meta-analytic findings illustrated decreases in self-esteem stability in late life (Trzesniewski, Donnellan, & Robins, 2003) and this may be particularly true for longer time-intervals because of accelerating challenges of late life and thus increases in individual differences (Dormann & Griffin, 2015; Trzesniewski, Robins, Roberts, Caspi, & Paul, 2004). Time-intervals not only affect the stability or autoregressive effect of variables, but also the interrelatedness of constructs (Voelkle, et al., 2012). With increasing time intervals, stability usually decreases, while cross-effects may decrease or increase. For example, Voelkle and colleagues showed that ignoring the different lengths of time intervals will affect the stability estimates of a construct (e.g., anomia), which in turn may bias the long-term interrelatedness with other constructs (e.g., between anomia and authoritarianism). No previous research actually tested such effects on self-esteem in dyadic contexts. Second, longitudinal research is primarily concentrating on between-person effects, and between-couple effects, respectively, instead of the actual within-person and within-couple processes. For example, the use of autoregressive models, such as the APIM, does not control for trait effects, so that the estimated effects may represent inadequate indicators of within-person or within-couple relationships (Hamaker et al., 2015). Hamaker and colleagues showed that ignoring the existing between-person differences can lead to inaccurate conclusions about the pattern of mutual influence. With the goal to explore within-couple associations of self-esteem development, it seems pivotal to apply a different analytical method. With the present study we set out to do just that.

**Table 1.** Descriptive statistics for husbands and wives self-esteem across time.

Time (year)	Wave	Husbands				Wives			
		<i>n</i>	Age	<i>M</i>	<i>SD</i>	<i>n</i>	Age	<i>M</i>	<i>SD</i>
T1 (1992)	W1	382	77.20	50.01	10.37	382	73.80	50.94	9.84
T2 (1994)	W3	233	78.71	53.09	10.04	256	75.67	52.30	9.77
T3 (2000)	W6	134	83.67	55.87	8.10	185	80.83	55.37	8.62
T4 (2003)	W7	78	85.34	57.72	8.43	137	82.86	58.74	7.65
T5 (2008)	W9	31	87.97	53.88	9.31	78	85.79	55.24	7.50
T6 (2011)	W11	23	90.35	49.27	11.76	68	87.90	51.72	11.30

Note. Self-esteem scores were *T*-standardized with respect to all Baseline (T1) participants ( $N = 2,127$ ,  $M = 50$ ,  $SD = 10$ , Range = 12.6–65.8); higher scores indicate higher self-esteem. Inconsistencies in average age change across time points (versus time-in-study) are due to (mostly mortality related) attrition.

## The present study

The aim of the present study was to examine the dyadic interrelatedness of within-couple self-esteem and its change using a sample of long-term married couples while controlling for between-person differences. We hypothesized that autoregressive effects, representing self-esteem stability of both spouses, decrease across longer time frames. In addition, we expected spouses' self-esteem change to be interrelated across time, although the size and (non)reciprocity are an empirical question. Based on previous findings (Yorgason et al., 2006), we suggest that effects of husbands on subsequent changes in their wives are stronger than the other way around. To test these hypotheses, we applied continuous time modeling (Driver, Oud, & Voelkle, 2015; Voelkle et al., 2012; Voelkle & Oud, 2013) to longitudinal data of 382 couples of the Australian Longitudinal Study of Aging (ALSA).

## Method

### Procedure

The current study uses a subsample of the ALSA (Luszcz et al., 2014), a population-based psycho-bio-social and behavioral study in Adelaide, South Australia. Baseline (Wave 1) started in 1992 and since then, 10 follow-up waves of varying intervals have been conducted. Detailed information on study procedures and constructs can be found in Luszcz et al. (2014; Luszcz, 1998). Here, we focus on material pertinent to the current study.

### Participants

At baseline, the ALSA comprised 2,087 participants both singles and couples. For this report, we examined data of all couples ( $N_{\text{Couples}} = 382$ ; 99% legally married) if: (a) Both partners participated at the baseline assessment and (b) both partners contributed at least one wave of self-esteem data. At baseline, husbands ( $M = 77.2$ ,  $SD = 5.4$ ) were about 3.5 years older than wives,  $M = 73.8$ ,  $SD = 5.2$ ,  $t(381) = 14.80$ ,  $p < .001$ . There were no gender differences in the percentage of husbands (45%) and of wives (49%) that left school by age 14 or younger,  $t(380) = -1.31$ ,  $p = .191$ . The average duration of marriage was more than 46 years ( $M = 46.3$ ,  $SD = 10.9$ ) and the average number of children was 3 ( $M = 2.7$ ,  $SD = 1.5$ ) for our 382 couples.

To examine sample selectivity, the couples sampled were compared to all other participants at baseline (T1). Results showed that our couples were younger ( $d = 0.67$ ), lived longer ( $d = 0.32$ ), and

had slightly higher self-esteem ( $d = 0.11$ ) than the full ALSA cohort. The two groups did not differ with respect to gender.

Our analyses use up to six occasions of longitudinal data spanning up to 18 years, across unequal intervals. Self-esteem was not assessed at Waves W2, W4, W5, W8, and W10. On average, W3 took place 2.03 years ( $SD = 0.28$ ) after W1, W6 took place 5.98 years ( $SD = 0.39$ ) after W3, W7 took place 3.06 years ( $SD = 0.36$ ) after W6, W9 took place 4.19 years ( $SD = 0.45$ ) after W7, and W11 took place 2.29 years ( $SD = 0.46$ ) after W9. As is common in research of old and very old individuals, sample attrition (primarily due to mortality) was considerable.

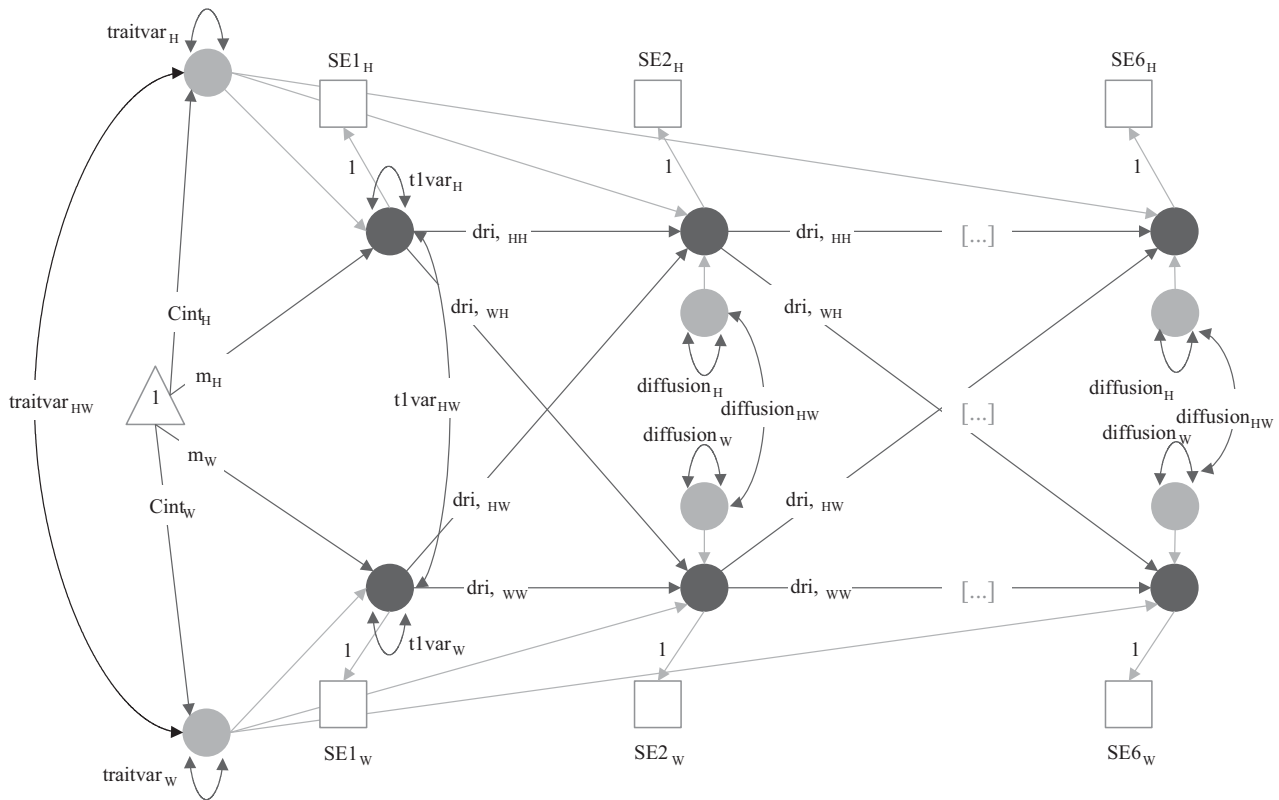
Across the six times assessed, the 382 couples provided 1,987 observations of self-esteem, 881 by husbands ( $M = 2.31$ ,  $SD = 1.33$ ) and 1,106 by wives ( $M = 2.90$ ,  $SD = 1.66$ ). More specifically, data on self-esteem for husbands (wives) was available for  $n = 121$  (87) for only one time-point, two time-points were available for  $n = 135$  (111), three for  $n = 61$  (66), four for  $n = 35$  (40), five for  $n = 13$  (29), and six for  $n = 17$  (49). The statistical procedure used in our analyses handles this type of mortality-related attrition by means of full information maximum likelihood estimation (for further information on attrition patterns, cf. Wagner et al. 2013).

### Measures

**Self-esteem.** The 10-item Bachman revision (1970) of Rosenberg's Self-Esteem Scale was used in the ALSA study to use a more age-adequate measure (see Ranzijn, Keeves, Luszcz, & Feather, 1998; for details see the Supplementary Material). Participants used a five-point Likert-type scale ranging from 1 ("almost always true") to 5 ("never true") and individual mean scores are computed (example item: "I feel that I have a number of good qualities"). Table 1 summarizes descriptive statistics on self-esteem.

### Analysis strategy

Our longitudinal dyadic data set has two characteristics that require specific methods of data handling. First, as aforementioned, longitudinal assessments were not assessed at equally spaced time intervals. Thus, applying traditional models would bias autoregressive and cross-lagged effect estimates, making it difficult or even impossible to compare estimates across time. Second, based on our old age sample, we are confronted with large amounts of (mortality-related) sample attrition. This is particularly true from T4 to T6 for which only a few participants survived or provided data.



**Figure 1.** A dyadic (or two-process) continuous time structural equation model (adapted from Driver, Oud, & Voelkle, 2015.) in our study with a focus on the drift matrix effects with auto effects illustrating within-person stability of self-esteem and cross effects illustrating interrelatedness in self-esteem within couples

Note. Light grey paths indicate those that are either fixed to certain values or have algebraic constraints to other parameters.

To address these two methodological challenges, a continuous time model was fitted to the data (Voelkle et al., 2012; Voelkle & Oud, 2013). This statistical approach of continuous time (CT) modeling uses stochastic differential equations to account for the unequal lengths of time intervals in our data. Thus, it brings back time into autoregressive cross-lagged panel models in a way that allows for the estimation of the underlying continuous time processes. Furthermore, the focus on the underlying process alters the conceptualization of missing values (Oud & Voelkle, 2014). Specifically, fewer data points for some participants compared to others are simply regarded as instances of unequal time intervals in the measurement of a continuously unfolding process (see also Wu, West, & Taylor, 2009). Thus, CT models are the statistical approach best suited to handle this complex data structure and model individual change processes across time.

The applied CT model represents a bivariate process model of average within-couple dynamics. To estimate CT models, the data is structured in wide format and a time variable specifies the time interval between each measurement point (cf., Table 1 for the used study-average time intervals). In our case, there was a 2-year interval between T1 and T2, a 6-year interval between T2 and T3, a 3-year interval between T3 and T4, a 5-year interval between T4 and T5, and a 3-year interval again between T5 and T6.

Figure 1 illustrates the model estimated in the current study. To specify the bivariate latent process model (latent self-esteem for husband and wife; dark circles in Figure 1), each latent variable loads on a single manifest indicator (squares in Figure 1). Loadings between latent self-esteem variables and manifest indicators are

fixed to 1.00 across all six occasions. At the initial measurement point, the model freely estimates means of both processes ( $m_H$ ,  $m_W$ ), as well as variances ( $t1var_H$ ,  $t1var_W$ ), and a covariance between latent self-esteem variables of spouses ( $t1var_{HW}$ ).

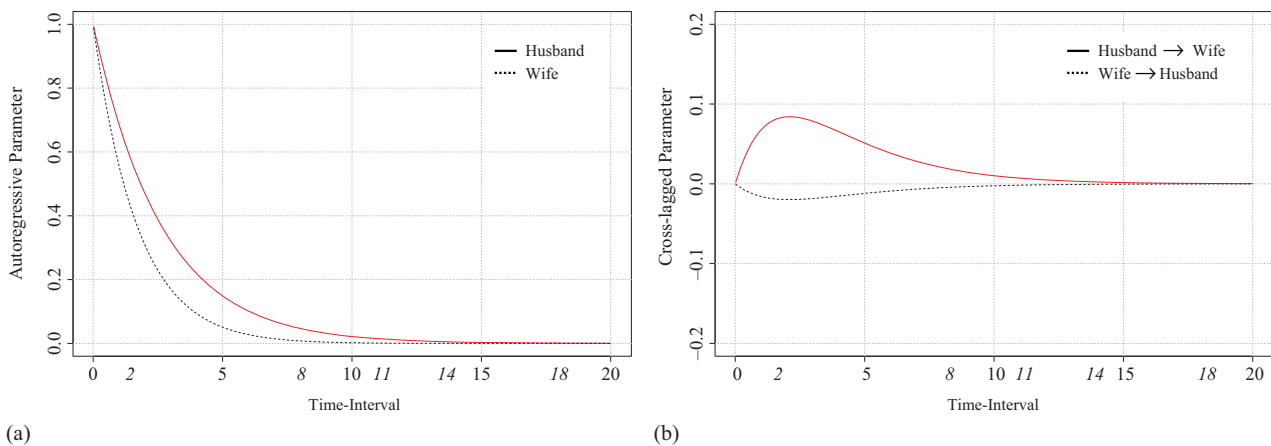
Our main interest in the models is on the auto- and cross-effects, reflecting the stability of self-esteem within husband and wife as well as the predictive effect of spouses for each other's self-esteem, respectively. To model self-esteem stability, continuous within-couple auto effects (drift<sub>HH</sub>, drift<sub>WW</sub>) are estimated between latent self-esteem variables of husbands and wives, respectively. To model the interrelatedness of self-esteem development within couples, a cross effect is estimated for each latent variable, in our case indicating predictive effects for the spouse's subsequent latent self-esteem (drift<sub>WH</sub>, drift<sub>HW</sub>). For cross effects, the first subscript always refers to the predicted (affected) process and the second indicator to the predictive process. Accordingly, drift<sub>WH</sub> captures the predictive effect of change in husband's self-esteem on changes in the wife's self-esteem at a later point in time. Based on the drift coefficients, we may easily compute the auto-regressive and cross-lagged effects for any time interval  $\Delta t$ , such as for a 1-year interval or for a 5-year interval. This should enhance our understanding of continuous developmental processes and their interrelatedness across time and over different time-intervals.

In addition, each latent process is characterized by a continuous intercept (cint<sub>H</sub>, cint<sub>W</sub>). Together with the auto- and cross-regression effects, these determine the mean level of each self-esteem process. Importantly, using CT models also give us the opportunity to explicitly account for stable interindividual

**Table 2.** Parameter estimates of the continuous time auto- and cross-effects model for unequal intervals for husbands' and wives' self-esteem.

Parameter	Continuous time parameter			
	Wives (DV)		Husbands (DV)	
	Estimate	[95% CI]	Estimate	[95% CI]
<b>Drift matrix (A)</b>				
Auto-effects	-0.59*	[-0.79/-0.39]	-0.38*	[-0.54/-0.22]
Cross/Partner-effects	0.11	[-0.07/0.29]	-0.03	[-0.21/0.15]
Continuous time intercept (b)	25.93*	[15.9/35.9]	21.87*	[13.1/30.6]
<b>Diffusion matrix (Q)</b>				
$\varphi$	62.05*	[57.8/66.3]	41.29*	[38.6/43.9]
$\varphi_w = \varphi_H$	9.71	[0.15/19.3]		
<b>Baseline (T1)</b>				
$M_{e1}$	50.94*	[49.9/51.9]	50.01*	[49.0/51.1]
<b>Trait</b>				
var	32.11*	[28.8/35.4]	36.84*	[32.7/41.0]
cov	12.78	[5.1/20.5]		
<b>Model indices</b>				
	-2 LL	df	n	AIC
	14132.7	1970	382	10192.7

Note. Self-esteem scores were *T*-standardized with respect to all Baseline (T1) participants ( $N = 2,127, M = 50, SD = 10$ ); DV = dependent variable.\*  $p < .05$ .



**Figure 2.** Discrete time parameter plots based on the Continuous Time (CT) model of continuous self-esteem processes accounting for between-couple differences representing (a) auto-effect (stability) parameters as a function of time-interval between observations for husbands (solid) and wives (dotted) and (b) cross-effect (partner effect; influence of Husband/Wife on Wife/Husband) parameters as a function of time-interval (with italic numbers illustrating the average unequal assessment waves) between observations for change in wife's self-esteem predicting subsequent self-esteem of the husband (dotted) and for change in the husband's self-esteem predicting the subsequent self-esteem of the wife (solid). It can be seen that parameters are varying over time time-intervals such that stability decreases across time for both sexes and that it appears that husbands predict wives self-esteem, but not vice versa. (For ease of representation, figures depict the CT model-parameters in a discrete-time representation of the process.)

differences by including a latent trait ( $\text{traitvar}_H, \text{traitvar}_W$ ), allowing the separation of within-couple dynamic processes in self-esteem and stable between-person differences.<sup>1</sup> Last, we note that despite the fact that discrete time parameters may differ for time intervals of different length, we assume the underlying continuous time parameters to be equal over time, in line with a parsimonious representation of reality (for a more thorough introduction, see Driver et al., 2015).

All models were fit to the data using the open software R (version 3.3.1) with the package ctsem (version 1.1.6, Driver, Oud, & Voelke, in press) which builds upon OpenMx (version 2.6.9, Neale et al., 2016). For model comparison based on our

hypotheses, we used likelihood ratio tests indicated by  $\Delta -2LL$ .

## Results

Table 2 summarizes the main results of the estimated CT model. Our major interest is in the auto- and cross-effect parameters of the drift matrix, that underlie the discrete time parameters depicted in Figure 2(a) and Figure (b) for  $0 < \Delta t \leq 20$  years. Autoregression parameters for a discrete time interval of 1 year ( $\Delta t_i = 1$ ) show average self-esteem stability of .69 for husbands and of .56 for

wives. Fixing the continuous auto effects to be the same across spouses substantially decreased model fit,  $\Delta-2LL(df = 1) = 158.08$ ,  $p < .001$ , indicating substantial differences between genders. Looking at the discrete parameter estimates, husbands illustrated higher stability effects compared to wives. For a longer time interval of 3 years ( $\Delta t_i = 3$ ), these coefficients show the expected decrease in stability ( $r_H = .32$ ,  $r_W = .17$ ; cf. Figure 2a). In addition, reported estimates and the figure show gender differences, with decline in self-esteem stability being stronger for wives compared to their husbands. However, for a longer time interval of about 10 years, both autoregressive effects asymptotically approach a stability of 0, suggesting that prior self-esteem no longer predicts changes in later self-esteem within husbands and within wives.

Parameter estimates of the cross (or partner) effects also indicate substantial gender differences (Table 2, Figure 2b). Fixing the continuous cross effects to be the same substantially decreased model fit ( $\Delta-2LL(df = 1) = 125.54$ ,  $p < .001$ ), indicating substantial differences between husband and wife in their mutual influence of each other. The cross-lagged effect of change in husband's self-esteem on wife's subsequent self-esteem shows a positive effect of 0.07 for a discrete time interval of 1 year. Looking at longer time intervals, the discrete time cross-lagged effect decreases (the cross-lagged effect is 0.07 with a discrete interval of 3 years and 0.05 with a discrete interval of 5 years) and approaches zero after about 10 years. The reverse cross-lagged effect of change in wife's self-esteem on the change in husband's self-esteem was found to be slightly negative ( $-0.02$  for a 1-year interval,  $-0.02$  for a 3-year interval). Importantly, these results are based on the model that accounts for differences in overall levels of husbands' and wives' self-esteem, that is, stable between-person differences.

## Discussion

The aim of the current study was to examine the dyadic interrelatedness of self-esteem in long-term couples of old age. Our results showed the expected decrease in discrete time autoregressive effects, which capture the stability of self-esteem, and suggested that the mutual influence between partners is not a reciprocal process of equal strength. In fact, our findings indicate that change in husband's self-esteem affected changes in wife's self-esteem, but not vice versa. With the current data and type of analyses, we add to previous research in several ways: (1) With the modeling approach, we actually estimate a continuous process of self-esteem development. (2) By including trait factors, we clearly differentiate within-couple dynamics from between-couple differences. (3) With observations up to over 18 years, we are able to model developmental processes across a lengthy period. (4) The couples in our sample are long-term partners and extend into very old age, thus enhancing our knowledge into very late life. In the following, we will integrate these findings, discuss possible consequences, and conclude with a number of limitations and an outlook to future research.

### *Dyadic associations of self-esteem in long-term couples*

In previous research, self-esteem has been shown to develop across the entire lifespan and to be characterized by substantial interindividual differences in change (Orth & Robins, 2014; Wagner, Gerstorf, Hoppmann, & Luszcz, 2013; Wagner, Hoppmann, Ram, & Gerstorf, 2015). One domain of life expected to be an important

predictor of self-esteem and its (late-life) change are social relationships. Based on sociometer theory, suggesting that self-esteem functions as a monitor of social belonging (Leary & Baumeister, 2000), we proposed that spouses may play an important role for each other's self-esteem development and this may be particularly true for couples with long relationship duration. Specific conditions of late life, such as retirement and reduced social network size (Wrzus et al., 2013), could additionally increase the mutual influence of spouses. Our results on longitudinal dyadic data of late life couples partially support these assumptions. Comparing the two cross-effects indicated substantial differences between spouses: Whereas the husband's effect on his wife was positive, the reverse effect was negative.

What could be possible explanations for such patterns? First of all, patterns might be related to structural characteristics such as power differences between genders. In earlier-born generations, women were often financially dependent on their husbands, were more likely to hold lower status positions or to be homemakers (Eagly & Steffen, 1984). It would be highly intriguing to see if such patterns in self-esteem dynamics persist in later-born couples that often show more equality with respect to education and income. A second explanation could be drawn from psychological notions. Women are still considered to be more communal compared to men (Eagly & Steffen, 1984; Gebauer, Wagner, Sedikides, & Neberich, 2013), a characteristic connected to be more concerned with the well-being of others. This might lead to more sensitivity with respect to the self-evaluation of the spouse. A third conceptualization of these self-esteem patterns might relate to general gender differences in self-esteem. Knowing that self-esteem is a predictor of important life outcomes such as well-being, depression or health (Orth, Robins, & Widaman, 2012), it can be regarded as a resource. With self-esteem levels for men being higher compared to women from early adolescence up until about the early 60s (Orth & Robins, 2014), the husband's self-esteem might not only be a resource for himself, but also for his spouse.

There are at least two additional aspects of our findings that deserve attention: First, results of the continuous time model showed that discrete time cross-lagged effects from husband to wife were specifically strong for intervals up to five years, but decreased to nonexistence for longer time intervals. It is a major strength of the CT model that time is considered continuous enabling us to model the actual dynamics of developmental processes independent of specific measurement occasions. For example, a study with a 1-year time interval might find a similar pattern to the 1-year pattern discussed above, whereas a study with 6 or more years between assessment waves may not reveal any interdependency between spousal self-esteem. To the best of our knowledge, this article is the first to track continuous within-couple development of self-esteem in long-term couples.

Second, our model is set up to control for stable interindividual differences in self-esteem. Accordingly, the modeled interdependency mirrors within-couple dynamics being independent of between-person/couple differences. Based on the argumentation of Hamaker et al. (2015), this should be regarded as necessary precondition to model and address reciprocal interdependencies between developmental processes within a person, or as done in our study, within a couple. Accounting for observed heterogeneity by including known between-couple covariates such as partnership duration in more heterogeneous samples would be an intriguing question to pursue in the future. Likewise, future research may

profit from studying the effect of time-dependent covariates such as the sudden illness of a spouse.

### Limitations and outlook

Our project has drawn from a number of strengths of the sample, the design, and the analysis method, including a relatively large number of long-wed couples, and the long time-span covered by the data. At the same time, we acknowledge several limitations that need to be considered when putting our findings in perspective. First, as a design limitation, one could question the long-term results of our study because at later measurement occasions only few data points were still available. In an attempt to evaluate the influence of possible selection effects, we estimated the same models using only the initial four measurement points, which yielded largely identical results. Second, as a limitation of the sample, with late life couples that have been married for almost half a decade, the current study had focused on a specific population segment. It is important to investigate whether dyadic associations in self-esteem as found here generalize to partners who are less well-off economically and in their health and to younger partners. For example, in younger and less traditional couples one could assume to find a pattern of stronger mutual predictive effects. Third, the time-intervals in our study are fairly long. Although considering time as continuous variable, shorter assessment-intervals might further help to better understand reciprocal within-couple processes (Deboeck & Preacher, 2016; Dormann & Griffin, 2015). In addition, couple-specific time intervals might further enlighten our understanding of dependencies in self-esteem development within couples.

Taken together, mutual influence in self-esteem development between long-term spouses differed substantially with positive effects of husband's on his wife's self-esteem, but a negative tendency of the reversed pattern. These within-couple dynamics derived from continuous time analyses add to the current literature of self-esteem development by highlighting the important role of spouses in late-life functioning and development.

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### Supplemental material

Supplementary material for this article is available online.

### Note

1. There are different ways to include a trait in a dynamic model. While some researchers propose to include a trait directly on the observed part (e.g., Hamaker et al., 2015), other researchers have advocated for the inclusion at the latent level (e.g., Oud & Jansen, 2000). In line with our conception of a trait as a random intercept in a differential equation, the latter approach was chosen. As pointed out by one of the reviewers, this choice implies "carry over" effects of the trait via the dynamic part of

the model that have to be taken into account when interpreting parameters. Indeed, we consider this an advantage of the chosen approach, because other than just controlling for stable inter-individual differences in discrete time, the chosen approach permits the estimation of subject-specific mean trajectories, towards which a subject's conditional mean regresses to (or regresses from in an unstable model).

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