

Supplemental Materials

Supplemental Section 1: Additional Methodological Details

Diagnostic Criteria

Diagnostic criteria for Alzheimer's Disease (AD) was based on the following core clinical criteria for all cause dementia from McKhann et al. (2011):

1. Interfere with the ability to function at work or at usual activities; and
2. Represent a decline from previous levels of functioning and performing; and
3. Are not explained by delirium or major psychiatric disorder;
4. Cognitive impairment is detected and diagnosed through a combination of (1) history-taking from the patient and a knowledgeable informant and (2) an objective cognitive assessment, either a "bedside" mental status examination or neuropsychological testing. Neuropsychological testing should be performed when the routine history and bedside mental status examination cannot provide a confident diagnosis.
5. The cognitive or behavioral impairment involves a minimum of two of the following domains:
 - a. Impaired ability to acquire and remember new information—symptoms include: repetitive questions or conversations, misplacing personal belongings, forgetting events or appointments, getting lost on a familiar route.
 - b. Impaired reasoning and handling of complex tasks, poor judgment—symptoms include: poor understanding of safety risks, inability to manage finances, poor decision-making ability, inability to plan complex or sequential activities.

- c. Impaired visuospatial abilities—symptoms include: inability to recognize faces or common objects or to find objects in direct view despite good acuity, inability to operate simple implements, or orient clothing to the body.
- d. Impaired language functions (speaking, reading, writing)—symptoms include: difficulty thinking of common words while speaking, hesitations; speech, spelling, and writing errors.
- e. Changes in personality, behavior, or comportment— symptoms include: uncharacteristic mood fluctuations such as agitation, impaired motivation, initiative, apathy, loss of drive, social withdrawal, decreased interest in previous activities, loss of empathy, compulsive or obsessive behaviors, socially unacceptable behaviors. (p. 265)

This all-cause criteria was used in tandem with the core clinical criteria for probable AD dementia from McKhann et al. (2011):

1. Meets criteria for dementia described earlier in the text, and in addition, has the following characteristics:
 - A. Insidious onset. Symptoms have a gradual onset over months to years, not sudden over hours or days;
 - B. Clear-cut history of worsening of cognition by report or observation; and
 - C. The initial and most prominent cognitive deficits are evident on history and examination in one of the following categories.
 - a. Amnestic presentation: It is the most common syndromic presentation of AD dementia. The deficits should include impairment in learning and recall of

recently learned information. There should also be evidence of cognitive dysfunction in at least one other cognitive domain, as defined earlier in the text.

b. Nonamnesic presentations:

- Language presentation: The most prominent deficits are in word-finding, but deficits in other cognitive domains should be present.
- Visuospatial presentation: The most prominent deficits are in spatial cognition, including object agnosia, impaired face recognition, simultanagnosia, and alexia. Deficits in other cognitive domains should be present.
- Executive dysfunction: The most prominent deficits are impaired reasoning, judgment, and problem solving. Deficits in other cognitive domains should be present.

D. The diagnosis of probable AD dementia should not be applied when there is evidence of (a) substantial concomitant cerebrovascular disease, defined a history of a stroke temporally related to the onset or worsening of cognitive impairment; or the presence of multiple or extensive infarcts or severe white matter hyperintensity burden; or (b) core features of Dementia with Lewy bodies other than dementia itself; or (c) prominent features of behavioral variant frontotemporal dementia; or (d) prominent features of semantic variant primary progressive aphasia or nonfluent/agrammatic variant primary progressive aphasia; or (e) evidence for another concurrent, active neurological disease, or a non-neurological medical comorbidity or use of medication that could have a substantial effect on cognition. (p. 265-266)

Behavioral-variant frontotemporal dementia (bvFTD) was diagnosed when patients exhibited at least three of the six criteria put forth by Rascovsky et al. (2011): “disinhibition, apathy/inertia, loss of sympathy/empathy, perseverative/compulsive behaviours, hyperorality and a dysexecutive neuropsychological profile.” (p. 2466)

Physiological Measurements

Autonomic and somatic nervous system measures were obtained using a system consisting of Biopac amplifiers and a computer with analog-to-digital capability. To calculate physiological linkage, we collected the following six measures: (a) cardiac interbeat interval (IBI): Beckman miniature electrodes with Redux paste were placed in a bipolar configuration on opposite sides of the participant’s chest—the inter-beat interval was calculated as the interval, in milliseconds, between successive R waves; (b) finger pulse amplitude (FPA): a UFI photoplethysmograph recorded the amplitude of blood volume in the finger using a photocell taped to the distal phalanx of the index finger of the non-dominant hand; (c) finger pulse transmission time (FPT): the time interval in milliseconds was measured between the R wave of the electrocardiogram (ECG) and the upstroke of the peripheral pulse at the finger site, recorded from the distal phalanx of the index finger of the non-dominant hand; (d) ear pulse transmission time (EPT): a UFI photoplethysmograph attached to the right earlobe recorded the volume of blood in the ear, and the time interval in milliseconds was measured between the R wave of the ECG and the upstroke of peripheral pulse at the ear site; (e) skin conductance level (SCL): a constant-voltage device was used to pass a small voltage between Beckman regular electrodes (using an electrolyte of sodium chloride in unibase) attached to the palmar surface of the middle phalanges of the ring and index fingers of the non-dominant hand; (f) general somatic activity (ACT): an electromechanical transducer attached to the platform under the participant’s chair

generated an electrical signal proportional to the amount of movement in any direction. All physiological data were sampled at 330 Hz and averaged every second. Artifacts in physiological data (e.g., caused by movements or procedural errors) were first identified by trained research assistants and then either interpolated using adjacent clean data points (for artifacts shorter than 10 seconds) or coded as missing (for artifacts equal to or longer than 10 seconds). Any physiological measure with more than 25% missing data for a participant was not included in data analyses.

Conflict Conversation Prompt

In line with previous work, we provide participants with a general outline of the Conflict Conversation without specifying the topic or type of disagreement that may be brought up:

“We are interested in how couples naturally interact. One thing we know about couples is that they often disagree. We are interested in how you talk about problems in your relationship. First, we need to choose a topic. Can you think of anything that you currently have different opinions about?”

“Now I’m going to leave the room and I’d like you to talk about [Topic] for 10 minutes. First, you’ll sit quietly for a resting period of five minutes without talking. Then when you hear my voice over the intercom, I’d like you to start talking about [Topic]. We’d like each of you to tell your side of the story and then try to work on the problem, so that maybe your two sides might get a little closer. We understand that you will probably not resolve a disagreement in 10 minutes, but this gives you a frame for the conversation. Try to stay on topic, but if you exhaust this topic, you can move onto another topic of disagreement. Do you have any questions?”

Supplemental Section 2: Supplemental Analyses

Note for all supplemental analyses that the diagnosis dummy variable, AD was coded as 0 and

bvFTD was coded as 1.

Supplemental Table 1. Intercorrelations between all variables used in Regression Model 2.

	1	2	3	4	5	6	7	8	9
1. Physiological Linkage	1								
2. Emotion Recognition	.379*	1							
3. Negative Emotional Reactivity	.149	.234	1						
4. Positive Emotional Reactivity	.215	.590**	.268	1					
5. PWD Age	.076	.173	.042	.001	1				
6. Diagnosis	-.211	-.553**	-.519**	-.552**	-.004	1			
7. CDR-Box Score	-.029	-.418**	-.074	-.534	-.107	.433**	1		
8. MMSE Score	-.049	-.110	-.163	.002	-.290	.276	-.049	1	
9. Caregiver Age	-.141	.148	-.074	-.062	.737**	.029	.023	-.229	1

Note: * $p < .05$; ** $p < .01$.

Supplemental Table 2. Regression Model 2 with caregiver type included as a covariate.

	<i>b</i> (SE)	β	95% C.I.	<i>p</i>
Emotion Recognition	0.011 (0.003)	.669	[0.004, 0.019]	.002
Negative Reactivity	-0.003 (0.005)	-.114	[-0.013, 0.006]	.505
Positive Reactivity	0.000 (0.005)	-.005	[-0.009, 0.010]	.978
PWD Age	0.002 (0.001)	.575	[0.000, 0.003]	.014
Caregiver Age	-0.002 (0.001)	-.686	[-0.003, -0.001]	.004
Diagnosis	0.007 (0.011)	.158	[-0.014, 0.029]	.508
CDR-Box	0.002 (0.002)	.186	[-0.002, 0.005]	.319
MMSE	0.000 (0.001)	-.093	[-0.001, 0.001]	.568
Caregiver Type	0.011 (0.011)	.165	[-0.011, 0.033]	.300

Note: For the Caregiver Type dummy variable, Spousal was coded as 0, Other was coded as 1.

Supplemental Table 3. Regression Model 2 with Marital Satisfaction included as a covariate, as measured using the Marital-Adjustment Test (Locke & Wallace, 1959).

	<i>b</i> (SE)	β	95% C.I.	<i>p</i>
Emotion Recognition	0.010 (0.003)	.584	[0.003, 0.016]	.007
Negative Reactivity	-0.009 (0.005)	-.324	[-0.019, 0.001]	.065
Positive Reactivity	0.002 (0.005)	.075	[-0.008, 0.011]	.722
PWD Age	0.002 (0.001)	.698	[0.001, 0.003]	.003
Caregiver Age	-0.002 (0.001)	-.774	[-0.004, -0.001]	.003
Diagnosis	0.006 (0.009)	.151	[-0.013, 0.026]	.504
CDR-Box	0.002 (0.002)	.179	[-0.002, 0.005]	.330

MMSE	0.000 (0.001)	-.089	[-0.001, 0.001]	.590
Marital Satisfaction	0.000 (.000)	.072	[0.000, 0.000]	.709

Note: This analysis only includes dyads with spousal caregivers.

Supplemental Table 4. Regression Model 2 with IBI linkage as dependent variable.

	<i>b</i> (SE)	β	95% C.I.	<i>p</i>
Emotion Recognition	0.007 (0.006)	.289	[-0.004, 0.018]	.225
Negative Reactivity	-0.001 (0.008)	-.032	[-0.017, 0.014]	.873
Positive Reactivity	0.000 (0.008)	.011	[-0.015, 0.016]	.962
PWD Age	0.000 (0.001)	-.089	[-0.003, 0.002]	.729
Caregiver Age	0.000 (0.001)	-.086	[-0.003, 0.002]	.740
Diagnosis	0.013 (0.016)	.215	[-0.020, 0.046]	.412
CDR-Box	-0.004 (0.003)	-.278	[-0.009, 0.002]	.188
MMSE	-0.001 (0.001)	-.246	[-0.003, 0.001]	.194

Supplemental Table 5. Regression Model 2 with SCL linkage as dependent variable.

	<i>b</i> (SE)	β	95% C.I.	<i>p</i>
Emotion Recognition	0.006 (0.015)	.134	[-0.026, 0.038]	.700
Negative Reactivity	-0.003 (0.019)	-.047	[-0.044, 0.038]	.882
Positive Reactivity	-0.005 (0.019)	-.084	[-0.044, 0.034]	.788
PWD Age	0.002 (0.003)	.261	[-0.004, 0.008]	.434
Caregiver Age	-0.004 (0.003)	-.463	[-0.009, 0.002]	.181
Diagnosis	-0.010 (0.052)	-.087	[-0.119, 0.100]	.855
CDR-Box	-0.007 (0.006)	-.308	[-0.021, 0.006]	.283
MMSE	-0.001 (0.004)	-.072	[-0.008, 0.007]	.868

Supplemental Table 6. Regression Model 2 with FPA linkage as dependent variable.

	<i>b</i> (SE)	β	95% C.I.	<i>p</i>
Emotion Recognition	0.010 (0.006)	.380	[-0.002, 0.022]	.101
Negative Reactivity	-0.013 (0.008)	-.312	[-0.029, 0.003]	.115
Positive Reactivity	0.003 (0.008)	-.093	[-0.013, 0.019]	.677
PWD Age	0.000 (0.001)	.095	[-0.002, 0.003]	.715
Caregiver Age	-0.001 (0.001)	-.231	[-0.003, 0.001]	.383
Diagnosis	0.019 (0.017)	.286	[-0.015, 0.054]	.259
CDR-Box	0.000 (0.003)	-.015	[-0.006, 0.006]	.943
MMSE	-0.002 (0.001)	-.368	[-0.004, 0.000]	.049

Supplemental Table 7. Regression Model 2 with FPT linkage as dependent variable.

	<i>b</i> (SE)	β	95% C.I.	<i>p</i>
Emotion Recognition	0.005 (0.006)	.185	[-0.008, 0.018]	.447
Negative Reactivity	0.000 (0.009)	-.003	[-0.018, 0.017]	.988
Positive Reactivity	0.005 (0.009)	.149	[-0.012, 0.023]	.534
PWD Age	0.000 (0.001)	.076	[-0.002, 0.003]	.773
Caregiver Age	-0.001 (0.001)	-.160	[-0.003, 0.002]	.547

Diagnosis	-0.004 (0.018)	-.057	[-0.042, 0.034]	.831
CDR-Box	0.002 (0.003)	.155	[-0.004, 0.008]	.469
MMSE	-0.001 (0.001)	-.149	[-0.003, 0.001]	.438

Supplemental Table 8. Regression Model 2 with EPT linkage as dependent variable.

	<i>b</i> (SE)	β	95% C.I.	<i>p</i>
Emotion Recognition	-0.002 (0.006)	-.085	[-0.013, 0.009]	.713
Negative Reactivity	-0.002 (0.007)	-.048	[-0.017, 0.013]	.811
Positive Reactivity	0.016 (0.007)	.498	[-0.009, 0.010]	.035
PWD Age	0.002 (0.001)	.426	[0.000, 0.004]	.113
Caregiver Age	-0.001 (0.001)	-.315	[-0.004, 0.001]	.238
Diagnosis	0.013 (0.016)	.203	[-0.020, 0.046]	.429
CDR-Box	0.001 (0.003)	.064	[-0.005, 0.006]	.756
MMSE	-0.001 (0.001)	-.141	[-0.003, 0.001]	.450

Supplemental Table 9. Regression Model 2 with ACT linkage as dependent variable.

	<i>b</i> (SE)	β	95% C.I.	<i>p</i>
Emotion Recognition	0.008 (0.005)	.358	[-0.003, 0.019]	.133
Negative Reactivity	-0.001 (0.007)	-.027	[-0.015, 0.013]	.891
Positive Reactivity	-0.011 (0.007)	-.350	[-0.025, 0.004]	.137
PWD Age	0.002 (0.001)	.500	[0.000, 0.004]	.065
Caregiver Age	-0.002 (0.001)	-.412	[-0.004, 0.000]	.127
Diagnosis	-0.003 (0.015)	-.044	[-0.033, 0.028]	.866
CDR-Box	0.001 (0.002)	.050	[-0.004, 0.006]	.810
MMSE	0.000 (0.001)	.105	[-0.001, 0.002]	.575

References

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