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For My Eyes Only: Gaze Control, Enmeshment, and Relationship Quality

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Perceived closeness that preserves the distinctness of each partner enhances intimate relationship quality, whereas pseudocloseness or enmeshment—reflecting an inability to distinguish one's own thoughts and emotions from a partner's—may have more negative outcomes (R. J. Green & P. D. Werner, 1996). Two studies investigated whether a dispositional inability to differentiate self from other is manifested at the attentional level as reduced capacity to inhibit following the gaze of another (A. Frischen, A. P. Bayliss, & S. P. Tipper, 2007). Among healthy elderly spouses in Study 1, superior gaze control predicted superior sociocognitive functioning, and those with poorer gaze control abilities were perceived by the partner as constricting the perceiving partner's autonomy, which in turn predicted lower relationship satisfaction among the latter. Moreover, these links were mediated by enmeshment, as indicated by the percentage of "we"-focused versus "I"- or partner-focused thoughts and emotions in the partners' independent accounts of the same relationship events. Extending these findings in a sample of Parkinson's disease patients and their spouses, Study 2 revealed a biphasic effect of self–other differentiation on relationship dynamics: In the early stages of the disease, increased couple focus promoted superior relationship quality, whereas lack of self–other differentiation predicted poorer relationship quality later. Thus, dispositional variations in fundamental social-perceptual processes predict both close relationship dynamics and long-term relationship quality.

Keywords: shared attention, theory-of-mind, working memory, relationship satisfaction, married couples

The human brain is a social brain: It can create a shared reality that enables coordinated social behavior for the pursuit of joint goals (Brothers, 1990), but this requires a perceptual common ground that links minds to the same physical actualities (Sebanz, Bekkering, & Knoblich, 2006). Presently, the main mechanism deemed responsible for this is *shared attention*—a triadic relationship wherein one individual follows an interlocutor's directed gaze to attend to the same object/location (Emery, 2000). The present research extends previous investigations of the role of shared attention or gaze following in adulthood. Specifically, although reflexive gaze following is a necessary precursor to superior social functioning in childhood (Charman et al., 2000), we propose that the ability to inhibit gaze following, when the situation warrants, predicts adaptive social functioning among adults (Langdon, Corner, McLaren, Ward, & Coltheart, 2006).

Despite research documenting the foundational role of shared attention in higher order sociocommunicative abilities in childhood (see Frischen, Bayliss, & Tipper, 2007) and the modulatory effect of early relationship experiences on gaze following processes (Hobson, Patrick, Crandell, Perez, & Lee, 2004), the precise roles of shared attention in adult sociocognitive functioning are still debated. Some argue that gaze following operates in an almost reflexive manner (e.g., Frischen et al., 2007), such that neurologically intact individuals cannot help but follow another's gaze, even if it provides no task-relevant information (Driver et al., 1999; Friesen & Kingstone, 1998). Research on symbolic attentional cuing points to the unique reflexive potency of shared attention mechanisms, which depend on a network encompassing the posterior superior temporal sulcus (Saxe, 2006) and the intraparietal sulcus (Frischen et al., 2007; Tipples, 2005). For example, neurologically intact individuals are more capable of overriding cuing effects of nonsocial prompts (e.g., directional arrows) com-

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pared with gaze cues (Ricciardelli, Bricolo, Aglioti, & Chelazzi, 2002). Indeed, although people can inhibit gaze following when instructed that gaze cues are *counterpredictive* of subsequent target location and there is sufficient delay (e.g., 1,200 or 1,800 ms) between presentation of gaze cue and target, gaze following persists at shorter delays (i.e., less than 1,200 ms; Friesen, Ristic, & Kingstone, 2004), although the magnitude of the effect may be moderated by individual differences. In contrast, attentional cuing effects in response to directional arrows can be overridden across all delays (Friesen et al., 2004).

Recent clinical research suggests that gaze control ability is a marker of optimal social functioning in adulthood. For example, schizophrenic patients who exhibit poor gaze control abilities also exhibit difficulty in differentiating between the self and another agent (e.g., regarding mental states, actions performed, etc.; see Langdon et al., 2006, Experiment 2). Thus, gaze control may reflect the capacity to differentiate self from other at the attentional level (i.e., regarding one's object of attention; see Frischen et al., 2007) and may therefore have implications for overall social functioning.

Our overarching hypothesis in the two studies presented here is that the ability to inhibit gaze following in response to situational demands predicts adaptive social functioning in adulthood (Langdon et al., 2006). Consistent with this possibility, Petrican and Moscovitch (2008) found that superior gaze control capacity predicted greater ability to represent the mental states of others, commonly referred to as *theory-of-mind* (ToM; Saxe, 2006). Specifically, when gaze cues were presented within the context of a socially impoverished stimulus (i.e., an inverted face), both young and older adults were able to inhibit gaze following when informed of its counterpredictive value (cf. Friesen et al., 2004). In contrast, when gaze cues were presented in the context of an ecologically valid social stimulus (i.e., an upright face), participants were less able to inhibit following a counterpredictive gaze, although superior sociocognitive abilities did facilitate gaze control under such circumstances. We attempted here to replicate the association between gaze control and global ToM abilities among healthy elderly couples (Study 1), and among elderly couples in which one partner manifested sociocognitive impairments (Study 2).

Moreover, based on Langdon et al.'s (2006) findings of an association between poor gaze control and failure to differentiate self from other at a cognitive-behavioral level, we investigated whether poor gaze control predicts failure to differentiate self from other within a close relationship context—a phenomenon linked to poor relationship outcomes in the clinical literature. Specifically, Green and Werner (1996) proposed a distinction between enmeshment (i.e., lack of self–other differentiation) and closeness (i.e., emotional intimacy and caregiving), and whereas the latter may constitute a defining feature of a functional relationship, the former is more dysfunctional, reflecting an inability to distinguish one's own perceptions, motives, feelings, opinions, and values from those of one's partner. If it is reasonable to assume that enmeshment manifests in actual behavior toward the partner—being overly solicitous, smothering, or controlling, for example—then we might expect the partner to react negatively to the perceived threat to his or her autonomy and be less satisfied with the relationship. For example, following the spouse's gaze and attending to the same object/location as she or he may help the attending partner to "read" the spouse's thoughts and may thus be regarded as a sign of the increased responsiveness of the attending partner. Nevertheless, the same behavior may be perceived as reflecting hypervigilance or an act of surveillance—perhaps leading the attended partner to feel suffocated, despite the attending partner's best intentions.

We sought to investigate these phenomena both among healthy elderly spouses (Study 1) and among elderly couples wherein one spouse had been diagnosed with a degenerative disorder resulting in increasing levels of physical disability, that is, Parkinson's disease (PD; Study 2). Given a previously demonstrated inverse relationship between well-being and emotional contagion and mimicry involving the care recipient and his or her caregiver (Monin & Schulz, 2009), we investigated whether poor self–other differentiation, as reflected in poor gaze control and increased enmeshment, would exhibit an increasingly stronger negative association with relationship quality with more years from disease onset and increasing patient disability.

Study 1

In Study 1, we tested two basic predictions. First, we examined whether gaze control—an index of self–other differentiation at the attentional level—predicts global ToM abilities within a sample of elderly married couples. Second, we examined the relational implications of gaze control and ToM abilities. More specifically, if failure to inhibit following the gaze of another indicates self–other differentiation failure at the attentional level, then we expected gaze control failure to predict enmeshment—that is, self–other differentiation failure at the cognitive-emotional level—as measured by the proportion of "we"-focused versus "I"-focused or partner-focused thoughts and emotions in a recalled relationship event. We expected both types of self–other differentiation failure, in turn, to predict negative partner reactions, specifically, aversive responses to perceived threats to autonomy and decreased relationship quality.

As a measure of gaze control ability, we used a procedure in which participants were explicitly asked to inhibit following the gaze of a schematic face in order to perform successfully on the experimental task. Schematic rather than realistic faces were used because both types elicit similar gaze-cuing effects (Hietanen & Leppanen, 2003; Tipples, 2005), and the former are relatively free from structural confounds (Tipples, 2005). Thus, participants completed a modified version of Friesen and Kingstone's (1998) gaze-following task, in which an upright or inverted face with eyes looking to the left or right preceded the appearance of a target letter. At the outset, participants were informed that the target would appear (75% of the time) opposite to where the eyes were looking. Inverted face trials were included because conditions that interfere with holistic face processing, such as inversion or brain damage causing prosopagnosia, also disrupt reflexive gaze-following mechanisms (R. Campbell, Heywood, Cowey, Regard, & Landis, 1990; Kingstone, Friesen, & Gazzaniga, 2000; Tipples, 2005). Consequently, the inverted condition can serve as a control for the effects of general cognitive decline on tasks that have an inhibitory component. Thus, we expected the upright face (i.e., socially relevant) condition to recruit reflexive gaze-following mechanisms (Driver et al., 1999; Kingstone et al., 2000; Petrican & Moscovitch, 2008; Tipples, 2005). In contrast, although inverted face gaze cues yield cuing effects (at least along the horizontal axis, as here, cf. Langton & Bruce, 1999), we expected them to parallel arrow-cuing results, with participants being able to override them when informed of their counterpredictive value (Friesen et al., 2004; Petrican & Moscovitch, 2008). Thus, we expected participants to be better at inhibiting gaze following when the face was presented as inverted versus upright.

To isolate the unique contribution of ToM abilities on gaze control, we had participants complete a complex spatial working memory (WM) task (Unsworth, Heitz, Schrock, & Engle, 2005). Performance on this task is a good indicator of overall inhibitory (executive) control abilities such that, relative to low-WM span individuals, high-WM span individuals show less interference on Stroop tasks and are better able to inhibit reflexive saccades on antisaccade tasks (Kane, Bleckley, Conway, & Engle, 2001; Kane & Engle, 2002).

Method

Participants. Forty elderly couples, married between 18 and 56 years ($M = 42.70$, $SD = 8.96$) participated (women's age: $M = 69.11$, $SD = 5.55$; men's age: $M = 72.15$ years, $SD = 5.92$). All were native English speakers or had lived in Canada and used English as the primary language for at least 30 years. They were recruited both through the University of Toronto's older adult volunteer pool and through advertisements in Toronto-based newspapers. They were compensated $10/hr for participating. All were screened for cognitive or neurological problems by the pool coordinator and as part of the consent process.

Materials.

The WM task. As a measure of WM, the automated E-prime version of the Symmetry Span task from http://psychology.gatech.edu/renglelab/index.htm was used; such automated versions have demonstrated good psychometric properties (Unsworth et al., 2005). As in all complex WM span tasks, visual presentation of the to-be-remembered stimuli is embedded within a processing task: Participants judge the symmetry of abstract designs while attempting to remember the location of colored squares that appear (Unsworth et al., 2005). The number of memory items ranges from 2 to 5, and there are three trials at each memory level (Unsworth et al., 2005). To ensure enough variability, the more lenient "total score" was used, that is, the total number of squares recalled in the correct position across all task trials (Unsworth et al., 2005).

The ToM battery. All ToM tasks were computer-administered, and participants' responses were audio recorded. The story and animation orders were randomized for each participant.

ToM stories. Participants read eight of Happé's (1994) ToM stories. Then they responded to two questions that assessed their understanding of the story content and their ability to make a ToM attribution (0 = *incorrect*; 1 = *partially correct*; 2 = *correct*).

False-belief stories. Participants also read two of Rowe, Bullock, Polkey, and Morris's (2001) false-belief stories. The first-order and second-order stories required, respectively, understanding that "One character [erroneously] thinks X" and that "One character [erroneously] thinks that another character thinks X." For each, participants answered a(n) (a) *false-belief* question, assessing understanding of the main character's false belief (0 = *incorrect*; 1 = *partially correct*; 2 = *correct*); (b) *inference* question, gauging capacity to make a nonmentalistic inference about an event not explicitly stated in the story; (c) *fact* question, tapping understanding of the nature of the event involved in the main character's false belief; (d) *memory* question, assessing recall of a story detail (0 = *incorrect*; 1 = *correct* for answers to othe aforementioned Questions 2–4).

Silent animations. Participants viewed Castelli, Frith, Happé, and Frith's (2002) silent animations featuring two triangles moving on a framed white background. In the four random (RD) animations, the triangles float independently across the screen. In the four goal-directed (GD) animations, the triangles' movements reflect interaction, simple desires, and straightforward intentions. The four ToM animations portray more complex interactions in which one triangle is responding or trying to influence the mental state of the other (Klein, Zwickel, Prinz, & Frith, 2009). Participants' responses to the question "What was happening in this animation?" were coded on the basis of whether they made the correct category attribution (random, ToM, or goal-directed) using a 0 (*highly inappropriate*) to 3 (*highly appropriate*) scale (see Castelli, Happé, Frith, & Frith, 2000).

Gaze control. Gaze control stimuli were designed following Friesen and Kingstone's (1998) guidelines. Participants were exposed to detection and localization response conditions, in counterbalanced order. In both conditions, a schematic face (upright in half of the trials, inverted in the other half) with blank eyes first appeared. After 680 ms, pupils appeared, looking left, right, or straight ahead. One hundred, 300, 600, or 1,000 ms later, a target letter (*F* or *T*) appeared to the left or right of the face. This display remained on the screen either until a response was made or until 2,700 ms had passed. The intertrial interval was 680 ms.

In the *detection* condition, participants were instructed to press the space bar as soon as they saw a letter and make no response if no letter appeared. In the *localization* condition, participants were directed to press the left arrow whenever a letter appeared to the left of the face, or the right arrow whenever a letter appeared on the right side of the face. At the beginning of each response condition, participants were informed that if the eyes looked to the left or right, then the letter was 75% more likely to appear opposite to the gaze, but if the eyes looked straight ahead, the letter was equally likely to appear to the left or right of the face.

In each of the two response conditions, there were 32 neutral trials in which the eyes looked straight ahead and the target letter was equally likely to appear on either side of the face, 32 cued trials in which the eyes looked left or right and the target letter appeared where the eyes were looking, and 32 uncued but predictive trials in which the eyes looked left or right and the target letter appeared opposite. The dependent variable was reaction time, in milliseconds, to the target letter. Given instructions that most of the time the letter would appear opposite to the location attended by the eyes, faster reaction times for cued trials were interpreted as reflecting poorer gaze control ability. Likewise, faster reaction times for uncued trials were interpreted as reflecting superior capacity to inhibit gaze following.

Autobiographical memory. Early on, spouses independently identified 10 emotional events involving both partners from the beginning of their marriage and 10 that occurred during the previous year. Between sessions, the experimenters compared the two spouses' event lists to identify one remote and one recent relationship event mentioned by both. During the second session, spouses were asked for a detailed verbal account of the two events. They were asked to focus on their own thoughts and emotions as well as on the thoughts and emotions that they assumed their spouse experienced during the two events. Participants received no additional memory prompts, nor were they told that they would recall the same events as the spouse. Thus, given the number of possible events to recount, it seemed plausible to assume that most participants discovered that they recalled the same events only during debriefing.

For events near the beginning of the marriage, participants described either their wedding day or the birth of their first child. The recent events described were more heterogeneous and included traveling, anniversaries, weddings of offspring, or births of grandchildren. Each spouse's verbal account was subsequently transcribed and coded for the number of event-specific thoughts and emotions uniquely attributed to (a) the self (i.e., "I"-focused); (b) the partner (i.e., "s/he"-focused); or (c) jointly to the self and partner (i.e., "we"-focused).

Relationship dynamics. Participants also completed measures assessing two types of dysfunctional interaction patterns germane to close relationships (Rempel & Burris, 2005). Specifically, four *Tethering* items (e.g., "I want to say and do things that will make my partner stay with me, even if I seem manipulative or controlling") assessed willingness to hurt one's partner in order to keep him or her close. Complementarily, five *Mutiny* items (e.g., "It's like I have no control over my own life, that everything has to be done my partner's way, and I want that to change") assessed perceptions of loss of control to the partner and the desire to reassert one's personal autonomy. Both scales used a 1 (*doesn't match my experience at all*) to 7 (*matches my experience exactly*) response format. Cronbach's alphas for Tethering ($M = 2.12$, $SD = 1.21$) and Mutiny ($M = 2.12$, $SD = 1.23$) were .67 and .71, respectively.

Perceived intimacy. Using a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), participants completed the six-item Emotional Intimacy subscale from the Personal Assessment of Intimacy in Relationships (PAIR) Inventory (Schaefer & Olson, 1981) to assess perceived closeness to one's spouse (e.g., "My partner can really understand my hurts and joys"; Cronbach's $\alpha = .82$; $M = 3.80$, $SD = 0.92$).

Relationship satisfaction. Finally, participants completed Norton's (1983) six-item Quality of Marriage Index using the same response format as the PAIR (e.g., "My relationship with my partner makes me happy"). Cronbach's alpha was .75, with a scale mean of 4.41 ($SD = 0.72$).

Procedure. In separate rooms, spouses completed the study in two 90-min sessions. In the first session, all completed the relationship-specific (i.e., relationship dynamics, perceived intimacy, and marital satisfaction) measures, followed by the shared emotional events identification list. In the second session, they first completed the autobiographical recall task, followed by the ToM, shared attention, and WM tasks (counterbalanced across participants).

Results and Discussion

Preliminary analyses. Participants' responses to the ToM battery and autobiographical memory task were coded by a primary rater, with a secondary rater coding half of the responses. There was very good interrater agreement (*r*s ranged from .90 to 1.00). All variables were standardized prior to analysis.

On the ToM story task, all participants answered correctly the question assessing their understanding of the story content. On the two false-belief stories, all participants answered correctly the control fact question. Subsequently, to control for the contribution of non-ToM abilities on each of the two false-belief stories, we regressed participants' scores for the false-belief questions onto their scores for the nonmentalistic inference and story memory questions and saved the standardized residuals of these regression analyses as pure indicators of participants' first- and second-order false-belief understanding abilities, respectively. On the silent animation task, to differentiate ToM abilities from simple contingency detection abilities, we regressed participants' appropriateness scores for the ToM and GD animations, respectively, onto their appropriateness scores for the RD animation task, and we saved the standardized residuals of these regression analyses as pure indices of participants' abilities to extract simple (from the GD animations) and complex (from the ToM animations) socioemotional information from movement patterns.

A principal-components analysis of participants' standardized ToM story scores, their corrected first- and second-order false-belief understanding scores, and their corrected appropriateness scores for the ToM and GD animations yielded a one-factor solution. This factor accounted for 37.8% of the variance and had moderate to high loadings (Hair, Anderson, Tatham, & Black, 1998) on all ToM scores: .65 (ToM stories), .51 (first-order false-belief understanding), .66 (second-order false-belief understanding), .62 (ToM animations), and .57 (GD animations).

For the shared events recalled in the autobiographical memory task, two types of scores were computed. The first constituted a measure of spouses' abilities to infer correctly the shared and partner-unique thoughts and emotions experienced during the events recalled. Raters first compared the two spouses' accounts of the same event and computed an accurate partner reading score, which represented the number of thoughts and emotions attributed by Partner A to Partner B that appear as self-focused thoughts and emotions in Partner B's account of the same event. An accurate "we"-focused score was computed similarly on the basis of the number of "we"-focused thoughts and emotions that appeared in both spouses' accounts of the same event. We used the average of these two scores as a rough measure of accuracy in inferring shared and partner-unique thoughts and emotions. We used this as a covariate in all subsequent analyses, for we wished to disentangle the effects of self–other differentiation from the effects of misinterpretation of a spouse's thoughts and emotions.

We also computed separate scores representing the number of self-focused, partner-focused, and "we"-focused thoughts and emotions identified by a given participant for a specific event. We computed overall scores by averaging the relevant scores on the two events recalled by each participant. Preliminary analyses revealed no significant differences among the three types of thought/emotion scores with respect to the number of positive and negative thoughts/emotions recalled. We computed enmeshment scores as a ratio between the average number of "we"-focused thoughts and emotions and the sum of self-focused and partner-focused thoughts and emotions across the two autobiographical events.

Preliminary analyses revealed two gender mean differences on the autobiographical memory and relationship-specific measures.

First, relative to men, women reported a higher number of thoughts and emotions overall, as well as a higher percentage of thoughts and emotions attributed to the partner. Second, men reported higher levels of intimacy.

To save space, the full correlation matrices were not included.[1] To account for dyadic data interdependence, we computed the correlation coefficients in hierarchical linear modeling (HLM) by entering the standardized values of the variables of interest (see the section below). Several correlations deserve mention: Consistent with previous findings (German & Hehman, 2006), WM scores were positive (.28) predictors of overall ToM factor scores ($p <$ .05). Suggestive of reactions to enmeshment, heightened perceptions of loss of control to the partner were associated with lower levels of intimacy and relationship satisfaction (rs $= -.33$ and $-.28$, respectively, $p < .05$), and one partner's self-reported tethering behavior was positively associated with the other partner's perceptions of loss of autonomy ($r = .37$, $p < .01$). At the same time, variations in dysfunctional relational styles among partners appeared complementary, for Tethering and Mutiny scores were positively correlated (rs from .37 to .63, $p < .01$) in all directions.

HLM analyses: Treatment of data.

Gaze control task. We eliminated all incorrect responses prior to all analyses. Because we found no performance differences among the four delays[2] or between the two task conditions, we collapsed across all trials. We used three methods to deal with reaction time outliers. First, we eliminated reaction times more than three standard deviations above or below the mean for that participant. This resulted in the elimination of 2% of all reaction time responses. Second, we computed mean reaction times for each participant for each of the six experimental conditions (i.e., Face Orientation × Cue Validity) and log-transformed the scores. The resulting distribution of the aggregated reaction time scores showed no evidence of outliers and exhibited skewness levels within generally acceptable levels (< .56).

Individual-differences variables. Preliminary analyses revealed two outliers on the enmeshment variable, so we excluded these two participants from all analyses involving enmeshment. The remaining data departed from normality and violated heterogeneity of variance assumptions; because no transformation normalized the data, we used raw scores and reported the robust standard error estimates for all analyses below (Hox, 2002).

Data analytic strategy and effect sizes. We wished to examine both within-person effects of cue validity and face orientation on reaction time in the gaze control task, as well as the moderating effect of between-person differences such as WM, ToM, autobiographical memory, and relationship-specific variables. Consequently, the use of HLM techniques (HLM 6.03; Raudenbush, Bryk, & Congdon, 2005) seemed appropriate. As Nezlek (2008) noted, when researchers are interested in the effect of between-person differences in within-person relationships, such as individual-differences effects in reaction time experiments, HLM provide better estimates than ordinary least square techniques. Hierarchical linear regression produces essentially the same parameter estimates as simple linear regression but accounts for the dependency inherent in nested data, such as our repeated measures gaze control data, and hence uses more appropriate estimates of standard errors to test statistical significance. Due to dependency in the couples' data, the model contained three levels, wherein reaction times on each gaze control trial type (Level 1) were nested within individuals (Level 2), who were nested within couples (Level 3). Following the recommendations of L. Campbell and Kashy (2002) for analysis of dyadic data in HLM, we tested hypotheses by running fixed slopes regression models. All Level 2 variables were standardized.

Given previous findings of significant gender differences in susceptibility to gaze and symbolic cuing of attention (Bayliss, di Pellegrino, & Tipper, 2005), we controlled for gender in all of the reported analyses. Model estimates are computed on the basis of the log-transformed reaction time data. Following Nezlek's (2008) advice for reporting effect sizes in HLM, we computed predicted values of the reaction time outcome variable on the basis of our fitted model. These reaction time effect size estimates are based on a model using untransformed average reaction times.

Gaze control: General results. To examine the effects of cue validity and face orientation on gaze control performance, we specified the following Level 1 model:

$$Y = \beta_0 + \beta_1 \times (\text{Orientation}) + \beta_2 \times (\text{Cue}) + \beta_3 \times (\text{Cue} \times \text{Orientation}) + E, \quad (1)$$

where Y is the log-transformed average reaction times for each participant for each of the six experimental conditions, (face) orientation is the dummy variable (coded 0 for inverted and 1 for upright), and cue is the ordinal variable (coded −1 for invalid, 0 for neutral, and 1 for valid).

As expected, results of this regression analysis revealed an interactive effect of face orientation and cue.[3] Specifically, despite our instructions, participants followed the gaze of the schematic face when presented upright, such that they were faster, on average, to respond to the letter if it was validly rather than invalidly cued ($\beta_3 = -.01$, $SE = .003$), $t(476) = -4.70$, $p < .01$. When the face was inverted, however, they were fastest at invalid locations, which was consistent with our instructions ($\beta_2 = .01$, $SE = .002$), $t(476) = 3.95$, $p < .01$ (see Table 1).

Gaze control and ToM abilities. For this analysis, we followed Nezlek's (2008) suggestions and tested the following full Level 2 model:

$$\beta_0 = \gamma_{00} + \gamma_{01}(\text{Gender}) + \gamma_{02}(\text{WM}) + \gamma_{03}(\text{ToM}) + \gamma_{04}(\text{Gender} \times \text{WM}) + \gamma_{05}(\text{Gender} \times \text{ToM}) + \gamma_{06}(\text{ToM} \times \text{WM}) + R. \quad (2)$$

$$\beta_i = \gamma_{j0} + \gamma_{j1}(\text{Gender}) + \gamma_{j2}(\text{WM}) + \gamma_{j3}(\text{ToM}) + \gamma_{j4}(\text{Gender} \times \text{WM}) + \gamma_{j5}(\text{Gender} \times \text{ToM}) + \gamma_{j6}(\text{ToM} \times \text{WM}). \quad (3)$$

[1] The full correlation matrices are available from Raluca Petrican upon request.

[2] We used different delays only to make it difficult for the participants to detect how long after the appearance of the pupils the target letter would appear.

[3] When introduced as single predictors, neither orientation nor cue exerted a significant effect on gaze control performance. However, when the Cue × Orientation term was introduced in the regression, the effect of Cue became significant, consistent with the discussed interactive effect of gaze and cue on gaze control performance.

Table 1
Effect Size Estimates in Milliseconds for Facilitation (−) or Inhibition (+) on Invalidly Cued (i.e., Predicted) Relative to Validly Cued Trials on the Gaze Control Task as a Function of Individual-Differences Variables for Studies 1–2

	Study 1			Study 2		
Trial type	Overall	Low ToM	High ToM	Overall	Low ToM	High ToM
Inverted face Predicted (uncued)-Cued	−22 ms (−24 ms)	*ns*	*ns*	−15.48 ms (−24 ms)	*ns*	*ns*
Upright face Predicted (uncued)-Cued	12.22 ms (11.75 ms)	20.46 ms	5.98 ms	30.2 ms (11.75 ms)	34.3 ms	25.86 ms

Note. For the inverted face condition, values in parentheses represent the size of the facilitation effect on predicted (i.e., invalidly cued) versus cued trials at the stimulus onset asynchonies (SOAs) of 100 and 600 ms observed with the arrow cuing (i.e., the nonsocial symbolic cuing condition that we hypothesized that was most similar to the inverted face condition) in Friesen et al. (2004). For the upright face condition, values in parentheses represent the size of the inhibition effect on predicted (i.e., invalidly cued) versus cued trials at the SOAs of 105, 300, and 600 ms observed with the same upright face task (for detection and localization response conditions) in Friesen and Kingstone (1998).

The first equation specifies that the grand-mean reaction time for a given individual across all experimental conditions is a function of the grand-mean reaction time across all experimental conditions across all individuals and a function of the respective individual's gender, WM, and ToM abilities. This is modeled as a random effect, hence we included the error term *R*. The second equation specifies that, for any given participant, the slopes from the Level 1 model, modeled as fixed effects (Nezlek, 2008), are a function of a grand-mean coefficient and a function of the respective individual's gender, WM, and ToM abilities.

Consistent with our hypotheses, higher ToM abilities predicted superior capacity to inhibit gaze-following behavior only in response to an upright face ($\gamma_{33} = .01$, $SE = .003$), $t(452) = 2.84$, $p < .01$ (see Table 1). Given that previous research identified a pivotal role of executive control abilities in performance on antisaccade tasks (Engle, 2002), our finding of a role of ToM, but not WM, in performance on a gaze control task raises the possibility that the gaze control task taps a distinct class of more specialized sociocognitive processes, whereas domain-free cognitive resources may support successful performance on traditional tasks requiring inhibition of reflexive attentional orienting, such as antisaccade tasks. Moreover, the effect of ToM abilities on gaze control performance in the socially relevant (i.e., the upright face) condition only, in the absence of a similar effect of WM abilities, supports the interpretation that gaze-cuing processes are distinct from general symbolic cuing or attentional orienting processes.

Gaze control and enmeshment. To investigate the relationship between gaze control abilities and enmeshment, after controlling for spouses' ability to intuit each other's thoughts and emotions during the recalled events, the following Level 2 model was specified:

$$\beta_0 = \gamma_{00} + \gamma_{01}\,(\text{Gender}) + \gamma_{02}\,(\text{AccThEm}) + \gamma_{03}\,(\text{Enm}) + R. \quad (4)$$

$$\beta_i = \gamma_{j0} + \gamma_{j1}\,(\text{Gender}) + \gamma_{j2}\,(\text{AccThEm}) + \gamma_{j3}\,(\text{Enm}). \quad (5)$$

Higher levels of enmeshment predicted poorer ability to inhibit gaze following in the *upright* face condition only ($\gamma_{33} = -.01$, $SE = .003$), $t(452) = -2.30$, $p < .05$ (see Table 2). Thus, the inability to differentiate self from other on an attentional level, as reflected in poor gaze control performance (Frischen et al., 2007), is indeed associated with lower levels of cognitive-emotional differentiation of self and partner in autobiographical accounts of relationship events.

Gaze control and perceived lack of autonomy. We also wished to examine the relationship between gaze control abilities and partners' perceptions of loss of autonomy after accounting for explicitly dysfunctional relationship dynamics (i.e., one partner tethers the other, who responds with mutiny, and vice versa). The

Table 2
Effect Size Estimates in Milliseconds for Inhibition (−) or Facilitation (+) on Invalidly Cued (i.e., Predicted) Relative to Validly Cued Trials on the Gaze Control Task as a Function of Relationship-Relevant Variables for Studies 1 and 2

	Upright face condition: Predicted-cued (ms)					
	Study 1		Study 2			
	Low	High	Low		High	
Variable			Early PD	Late PD	Early PD	Late PD
Enmeshment	10.54 ms	21.38 ms	18.72 ms		61.12 ms	
Partner-perceived lack of autonomy	6.68 ms	19.8 ms	41.26 ms	4.3 ms	.82 ms	57.52 ms
Partner marital satisfaction	16.78 ms	9.66 ms	−6.08 ms	109.18 ms	21.84 ms	−15.32 ms

Note. PD = Parkinson's disease.

rationale underlying this analysis was that the effect of gaze control on partner autonomy is exerted beyond the will or any ill motivation on the part of the attending partner. To this end, we regressed partner Mutiny scores upon partner Tethering scores, as well as self Mutiny and Tethering scores, and we entered the resulting standardized residual in the following model[4]:

$$\beta_0 = \gamma_{00} + \gamma_{01}\,(\text{Gender}) + \gamma_{02}\,(\text{PMutiny\_residual}) + R. \quad (6)$$

$$\beta_i = \gamma_{j0} + \gamma_{j1}\,(\text{Gender}) + \gamma_{j2}\,(\text{PMutiny\_residual}). \quad (7)$$

Results revealed that, indeed, a significant portion of the residual variance in self ratings of loss of autonomy to the partner (i.e., mutiny) was accounted for by poorer partner gaze control abilities ($\gamma_{32} = -.01$, $SE = .003$), $t(456) = -2.23$, $p < .05$ (see Table 2). Specifically, in the upright face condition only, partners of individuals who reported a high level of perceived loss of autonomy exhibited significantly stronger tendencies to follow the gaze of the schematic face, relative to partners of individuals who reported low levels of perceived loss of autonomy.

Gaze control and relationship quality. Next, we investigated the hypothesis that poor gaze control abilities would result in lower levels of partner marital satisfaction. Because we conceptualized self–other differentiation, as reflected in gaze control processes, to be distinct from empathy and emotion contagion processes, its effect on marital quality should be independent of emotional intimacy. Thus, to investigate the unique effect of gaze control processes on relationship outcomes from the partner's perspective, we computed a residual partner relationship satisfaction score resulting from regressing raw partner self-reports of marital satisfaction on self and partner ratings of emotional intimacy, which we introduced in the following Level 2 model:

$$\beta_0 = \gamma_{00} + \gamma_{01}\,(\text{Gender}) + \gamma_{02}\,(\text{PR\_residual}) + R. \quad (8)$$

$$\beta_i = \gamma_{j0} + \gamma_{j1}\,(\text{Gender}) + \gamma_{j2}\,(\text{PR\_residual}). \quad (9)$$

Results indicated that better ability to modulate gaze-following behavior in the *upright face condition only* was uniquely related to partners' reports of increased relationship satisfaction ($\gamma_{32} = .01$, $SE = .002$), $t(468) = 2.02$, $p < .05$ (see Table 2). Specifically, partners of high-marital satisfaction participants exhibited better ability to inhibit gaze following, relative to partners of low-marital satisfaction individuals. This supports our hypothesis that poor self–other differentiation, reflected on the attentional level as reduced ability to inhibit gaze following, is associated with poor relationship outcomes.

Enmeshment, perceived lack of autonomy, and relationship quality. To investigate the hypothesis that poor gaze control predicts higher levels of enmeshment, which in turn predicts poorer relationship outcomes, we ran two sets of analyses. To account for dyadic data interdependence, the coefficients reported next were computed in HLM by entering the standardized values of the variables of interest and running two fixed slopes models (see L. Campbell & Kashy, 2002). These coefficients can be interpreted as traditional correlation coefficients. In the first set of analyses, we examined the correlations among enmeshment and the residual relational dynamics and quality variables.

After controlling for accuracy in inferring the shared and partner-unique thoughts and emotions experienced during the recalled event, enmeshment levels were positively associated with the residual values of partner ratings of perceived loss of autonomy (PMutiny_residual, cf. Equations 6 and 7), $b = .18$, $SE = .08$), $t(73) = 2.22$, $p < .05$, and negatively associated with the residual values of partner ratings of marital satisfaction (PR_residual, cf. Equations 8 and 9), $b = -.31$, $SE = .12$), $t(75) = -2.59$, $p < .05$. Moreover, there was a significant negative association between the two partner ratings of relational dynamics and quality ($b = -.22$, $SE = .08$), $t(76) = -2.84$, $p < .01$.[5]

Next, we investigated whether the association between poor self–other differentiation on the attentional level and partner perceived loss of autonomy can be explained by the significant association of the latter with enmeshment levels.[6] To this end, we specified the following model:

$$\beta_0 = \gamma_{00} + \gamma_{01}\,(\text{Gender}) + \gamma_{02}\,(\text{PMutiny\_residual}) + \gamma_{03}\,(\text{Enm}) + \gamma_{04}\,(\text{AccThEm}) + R. \quad (10)$$

$$\beta_i = \gamma_{j0} + \gamma_{j1}\,(\text{Gender}) + \gamma_{j2}\,(\text{PMutiny\_residual}) + \gamma_{j3}\,(\text{Enm}) + \gamma_{j4}\,(\text{AccuracyThEm}). \quad (11)$$

As expected, the association between gaze control and partner mutiny became nonsignificant, but enmeshment scores remained significantly related to gaze control abilities ($\gamma_{33} = -.01$, $SE = .003$), $t(436) = -1.99$, $p < .05$, consistent with our proposal that enmeshment mediates the association between gaze control failures and partner's perceptions of loss of autonomy.

We also examined whether the association between gaze control and partner ratings of marital satisfaction is explained through the association of the latter with (a) partner mutiny and (b) enmeshment. To examine our first hypothesis, we specified the following Level 2 model:

$$\beta_0 = \gamma_{00} + \gamma_{01}\,(\text{Gender}) + \gamma_{02}\,(\text{PR\_residual}) + \gamma_{03}\,(\text{PMutiny\_residual}) + R. \quad (12)$$

$$\beta_i = \gamma_{j0} + \gamma_{j1}\,(\text{Gender}) + \gamma_{j2}\,(\text{PR\_residual}) + \gamma_{j3}\,(\text{PMutiny\_residual}). \quad (13)$$

As expected, the association between gaze control and both relationship variables became nonsignificant.

[4] Because one participant did not complete the Mutiny and Tethering scales, only 39 couples were included in this analysis.

[5] The reported correlations among enmeshment and the two relationship quality variables remained significant when the raw values of the respective relationship variables were introduced in the analysis. Nevertheless, for the purposes of our proposed model, we were interested in the residual partner mutiny and marital satisfaction variables.

[6] Because there were two outliers on enmeshment and one participant did not complete the Mutiny and Tethering scales, only 39 couples (i.e., 76 individuals) were included in this analysis.

Next, we specified the following Level 2 model:

$$\beta_0 = \gamma_{00} + \gamma_{01}\,(\text{Gender}) + \gamma_{02}\,(\text{PR\_residual}) + \gamma_{03}\,(\text{Enm}) + \gamma_{04}\,(\text{AccThEm}) + R. \quad (14)$$

$$\beta_i = \gamma_{j0} + \gamma_{j1}\,(\text{Gender}) + \gamma_{j2}\,(\text{PR\_residual}) + \gamma_{j3}\,(\text{Enm}) + \gamma_{j4}\,(\text{AccThEm}). \quad (15)$$

Also, as expected, the association between gaze control and partner ratings of relationship quality became nonsignificant. There remained a significant association between enmeshment and gaze control abilities ($\gamma_{33} = -.01$, $SE = .002$), $t(440) = -2.30$, $p < .05$, consistent again with our proposal that enmeshment mediates the effect of self–other differentiation at the attentional level on partner marital satisfaction. Taken together, with the partner mutiny findings, the residual association between gaze control and increased focus on the unit of the couples relative to the individual partners raises the possibility that the former may not always be related to poor relationship outcomes.

Gaze control, overall sociocognitive functioning, and relationship quality. Finally, we investigated whether global ToM abilities mediated the association between gaze control abilities and relationship outcomes. Of all the variables of interest, global ToM was significantly associated only with partner ratings of intimacy ($b = .33$, $SE = .11$), $t(75) = 3.96$, $p < .001$. This finding rules out the possibility that global ToM abilities could account for the observed associations between gaze control and relationship outcomes.

Thus, conceptually replicating our previous findings (Petrican & Moscovitch, 2008), the present study demonstrated a link between flexibility in basic socioperceptual processes, as reflected in successful gaze control performance, and sociocognitive functioning within a sample of elderly married couples. Moreover, gaze control failures, presumed to reflect difficulties in self–other differentiation on an attentional level (Frischen et al., 2007), predicted self–partner differentiation failures in an autobiographical recall task, as evident in a higher percentage of enmeshed (i.e., "we"-focused) relative to differentiated (i.e., self-focused and partner-focused) thoughts and emotions. Finally, it was the overlapping variance of gaze control and enmeshment that predicted relationship outcomes. That is, spouses with poorer gaze control abilities demonstrated poorer self–partner differentiation on the autobiographical recall task, and they were perceived by the spouse as constricting that spouse's autonomy, which in turn predicted lower marital satisfaction among the latter.

Study 2

Study 2 was intended as a conceptual replication of Study 1 and involved a sample for whom issues of personal autonomy would be particularly salient—specifically, PD patients and their spouses. PD is a degenerative neurological disorder with a prevalence of 1/1,000 (Peto, Jenkinson, Fitzpatrick, & Greenhall, 1995). Uncommon before age 40, PD affects around 1% of people over age 60 and around 2% of people over age 80 (Macphee & Stewart, 2007). The male-to-female ratio is around 3:2 (Ferguson, Rajput, Muhajarine, Shah, & Rajput, 2008). The clinical signs of PD are primarily motor and include slowness of movement, rigidity, resting limb tremors, and postural and balance problems (Ferguson et al., 2008). Nonmotor symptoms such as dementia and depression often appear as PD progresses, and PD thus adversely affects the quality of life of both patients and their families (Macphee & Stewart, 2007).

With this in mind, we first sought to replicate Study 1's findings that (a) gaze control predicts global ToM abilities in both patients and their spouses and (b) gaze control failures predict enmeshment and poor relationship outcomes. Second, we explored the possible moderating effects of PD symptom severity and number of years from PD onset.

Method

Participants. Eighteen PD patients and their spouses received $10/hr for participating. The patients were recruited through local newspaper advertisements or through their neurologist, who was affiliated with a teaching hospital associated with the University of Toronto. According to the patients' medical records (released with their consent), they were all nondemented and none was clinically depressed at the time of testing. The patients' spouses verified that they themselves had no known neurological or cognitive impairments.

The patients (six women, 12 men; mean age = 68.50 years [SD = 11.67]) averaged 2.56 (range = 1.0–3.0) on the modified Hoehn and Yahr (1967) disability scale. Excepting one who developed intolerance to L-dopa 6 months prior, all were taking dopamine precursor treatments (i.e., L-dopa) to alleviate Parkinsonian symptoms. Spouses' average age was 67.28 years (SD = 10.23). The couples had been married between 18 and 53 years (M = 39.28, SD = 11.67). All were native English speakers or had lived in Canada and used English as their primary language for at least 30 years.

Materials and procedure. Participants completed the same tasks as in Study 1. The composition of the remote and recent relationship events was similar. Cronbach's alphas were .62, .66, .86, and .61 for Mutiny (M = 2.53, SD = 1.25), Tethering (M = 1.82, SD = 1.12), relationship satisfaction (M = 4.15, SD = .98), and emotional intimacy (M = 3.75, SD = .83), respectively. Patients completed an adapted, abbreviated version of the Parkinson's Disease Questionnaire (PDQ-39; Peto et al., 1995), wherein they rated the percentage of time, within the previous 3 months, that they experienced relevant symptoms/impairments across the domains of mobility, cognitions, emotional well-being, social functioning, and social support. Cronbach's alphas for the PDQ subscales ranged from .95 to .97.

Because the mobility and cognitions facets exhibit the highest correlations with clinical measures of Parkinsonian symptom severity, such as the Hoehn and Yahr (1967) stage and the Schwab and England (1969) score (ranging from .50 to .60 and from .28 to .33 for the mobility and cognitions facets, respectively; see Herlofson & Larsen, 2003), patients' scores on these two subscales were averaged to create a measure of current PD symptom severity,[7] which was negatively correlated with patients' WM scores, $r(16) = -.54$, $p < .05$.

[7] Given that the patients' ratings of the severity of their motor and cognitive impairments were significantly correlated with their ratings of well-being, both affective and cognitive, we ran all the Study 2 analyses controlling for well-being levels. The results remained unchanged, hence we present the simplified versions of the analyses that most closely replicate the Study 1 analyses.

Results and Discussion

Preliminary analyses. As in Study 1, participants' responses to the ToM battery and autobiographical memory task were coded by a primary rater, with a secondary rater coding half of the responses. Interrater agreement was excellent (*r*s from .90 to 1.0).

Due to the relatively small sample size, we combined the ToM data from the two studies and performed a principal-components analysis. The resulting single factor explained approximately 32.38% of the variance and, with the exception of the first-order false-belief understanding score (.38), had moderate to high loadings on all ToM scores: .70 (ToM stories), .59 (second-order false-belief understanding), .60 (ToM animation appropriateness), and .52 (purposeful animation appropriateness). The lower loading of the first-order false-belief understanding score on the ToM factor is consistent with developmental research suggesting that first-order false-belief understanding represents a proto-ToM ability, foundational to more complex sociocognitive abilities (Talwar & Lee, 2008).

Enmeshment and accuracy in reading and partner-specific thoughts and emotions scores were computed as in Study 1. Preliminary analyses revealed no valence differences among "we"-, self-, and partner-focused thoughts and emotions.

To save space, the full correlation matrices were not included (see Footnote 1). Several correlations deserve mention here, however: As in Study 1, heightened perceptions of loss of control to the partner were associated with lower levels of intimacy and relationship satisfaction (*r*s ranged from $-.37$ to $-.78$, one-tailed $p\text{s} < .05$–.01). Moreover, variations in dysfunctional relational styles among partners appeared complementary, in that Tethering and Mutiny scores tended to be positively correlated (*r*s ranged from .49 to .57, one-tailed $p\text{s} < .05$). Nevertheless, although intimacy was strongly correlated with marital satisfaction in spouses ($r = .85$, $p < .01$), that was not the case for patients ($r = .14$). It is possible that PD-related disability affects patients' perception of relationship intimacy, but patients ascribe it less importance when judging marital satisfaction, perhaps as an acknowledgement of spouses' objective limitations in understanding PD-related changes.

Finally, 95% confidence interval comparisons between patients and their spouses, and between the Study 1 and Study 2 samples, revealed several interesting results. First, replicating previous findings regarding PD-specific impairments (Saltzman, Strauss, Hunter, & Archibald, 2000), PD patients scored significantly lower than the Study 1 sample on both the ToM and the WM tasks. Compared with their spouses, PD patients appeared impaired only on the WM task (cf. Macphee & Stewart, 2007), although this difference was reduced to nonsignficance when controlling for patients' PD-related symptom severity. Second, compared with the Study 1 sample, PD patients exhibited significantly higher levels of perceived loss of autonomy to their spouses, reflected both in the raw Mutiny score and in the residual (see Study 1) Mutiny score. In contrast, PD patients' spouses did not differ on the raw Mutiny score compared with the Study 1 sample. Finally, as in Study 1, ToM and WM abilities were not significantly related to any of the relationship functioning measures, and thus could not be implicated as mediators of associations between the latter and gaze control.

Hierarchical linear modeling analyses: Treatment of data.

Gaze control task. We eliminated all incorrect responses prior to all analyses. Outlier identification (as in Study 1) resulted in deletion of .77% of all reaction time responses. The resulting distribution of the aggregated reaction time scores across the six experimental conditions, which was subjected to a log-transformation, showed no evidence of outliers and exhibited skewness within generally acceptable levels ($< .38$).

Individual-differences variables. Preliminary analyses revealed two outliers (i.e., a patient and a spouse from distinct couples) on the enmeshment variable only. The outlier spouse also failed to complete the intimacy and marital satisfaction scales. Consequently, in order to keep an equal number of patients and spouses, we excluded these participants from all reported analyses. Due to the relatively small sample size, we were not able to use the robust standard error estimates (Hox, 2002). Nevertheless, apart from enmeshment, all variables were within reasonable skewness distances from normality (absolute values between 1 and 1.7). We applied a square-root transformation to the enmeshment variable, and this brought its skewness to relatively normal levels ($< .93$).

Data analytic strategy and effect sizes. Due to the dependency in the couples' data, the HLM model for Study 2 contained three levels, wherein reaction times on each gaze control trial type (Level 1) were nested within individuals (Level 2), who were nested within couples (Level 3). Following the recommendations of L. Campbell and Kashy (2002) for analysis of dyadic data in HLM, we tested our hypotheses by running fixed slopes regression models. We used the same effect size computation procedure as in Study 1 (Nezlek, 2008). Prior to analyses, we standardized Level 2 and Level 3 variables.

To account for the PD-specific impairments, we introduced a dummy variable PATIENT, coded 0 for spouse and 1 for patient. To account for the effect of PD symptom severity and years from onset, we introduced them as Level 3 predictors for the Level 2 intercept and slopes:

$$\gamma_{00} = \gamma_{000} + \gamma_{001}\,(\text{YEARS\_ONSET}) + \gamma_{002}\,(\text{PD\_SEVERITY}) + R. \quad (16)$$

$$\gamma_{i} = \gamma_{ji0} + \gamma_{ji1}\,(\text{YEARS\_ONSET}) + \gamma_{ji2}\,(\text{PD\_SEVERITY}). \quad (17)$$

Equation 16 specifies the intercept as an average intercept across all Study 2 couples, years from PD onset, severity of motor and cognitive PD symptoms (as assessed by PDQ-39), and a residual component, specific to each couple. Equation 17 specifies the fixed Level 2 slopes (see Nezlek, 2008) as a function of years from PD onset and severity of motor and cognitive PD symptoms. We used this Level 3 model in all the analyses reported next. As a conceptual replication of Study 1, we report one-tailed *p* values associated with tests of all directional hypotheses. We report two-tailed *p* values when examining the modulating effect of years from PD onset and PD symptom severity on the association between gaze control and relationship-relevant variables, however.

Gaze control: General results. Using the same Level 1 model, we replicated the results of Study 1: Despite our instructions, participants followed the gaze of the schematic face when presented upright, such that they responded more quickly to the letter if it was validly, rather than invalidly, cued ($\beta_3 = -.02$, $SE = .01$), $t(200) = -3.52$, one-tailed $p < .01$. In contrast, in the inverted face condition, participants were faster if the letter appeared at the predicted, rather than cued, location ($\beta_2 = .01$, $SE = .003$), $t(200) = 1.60$, one-tailed $p = .055$ (see Table 1).

Gaze control and ToM abilities. After controlling for gender and patient status, we replicated the main effect of ToM on gaze control performance. That is, for both patients and spouses, superior ToM abilities predicted better gaze control when the gaze cues appeared in the context of a social stimulus (i.e., an upright face) (γ_{33} = .04, SE = .02), $t(120) = 1.92$, $p < .05$ (see Table 1).

Gaze control and enmeshment. To investigate the relationship between gaze control abilities and enmeshment after controlling for spouses' ability to intuit each other's thoughts and emotions during the recalled events, we used the same Level 2 model as in Study 1, additionally accounting for patient status (cf. Equations 4 and 5). Paralleling Study 1, we found that, irrespective of number of years from PD onset or PD symptom severity, higher levels of enmeshment for both patients and spouses predicted poorer ability to inhibit gaze following in the upright face condition only ($\gamma_{33} = -.01$, SE = .01), $t(144) = -2.15$, two-tailed $p < .05$ (see Table 2). Thus, once again, the inability to differentiate self from other on an attentional level, as reflected in poor gaze control performance (Frischen et al., 2007), was associated with lower levels of cognitive-emotional differentiation of self and partner in autobiographical accounts of relationship events.

Gaze control and perceived lack of autonomy. We also examined the relationship between gaze control abilities and partners' perceptions of loss of autonomy after accounting for explicitly dysfunctional relationship dynamics and the moderating effect of years from PD onset and PD symptom severity. We regressed partner Mutiny scores on self and partner Tethering scores and self Mutiny scores, and we entered the resulting standardized residuals in the same model as in Study 1 (cf. Equations 6 and 7).

Results indicated that, in the upright face condition only, the negative effects of gaze control failures on partner perceptions of autonomy vary as a function of years from PD onset ($\gamma_{331} = -.01$, SE = .01), $t(156) = -2.03$, two-tailed $p < .05$. Specifically, in early stages of PD, decreased self–other differentiation on an attentional level does not predict increased partner perceptions of lack of autonomy: The effect even trends in the opposite direction. When the patient is in relatively advanced stages of PD, however, the Study 1 results replicate: Increased levels of perceived lack of autonomy exhibited by one spouse are associated with stronger gaze cuing effects in the other, in the upright face condition only (see Table 2). This suggests that early after PD onset—when both partners are still looking for adaptations to their new life circumstances—increased vigilance and responsiveness is not detrimental to the relationship (and is perhaps even beneficial). Nevertheless, with more years from PD onset—once spouses may have already habituated to their change of circumstances—self–other differentiation failures have the same detrimental effect observed among Study 1's healthy elderly couples.

Gaze control and relationship quality. Next, we investigated the hypothesis that poor gaze control abilities, reflecting poor self–other differentiation at the attentional level, would result in lower levels of partner marital satisfaction, independent of emotional intimacy. Aforementioned correlational analyses revealed that intimacy and relationship satisfaction may be linked differently for patients and spouses. Hence, to investigate the unique effect of gaze control processes on relationship outcomes, we introduced the standardized values of partner marital satisfaction and self and partner ratings of emotional intimacy in the same Level 2 model as in Study 1 (see Equations 8 and 9). This analysis is conceptually identical to the one performed in Study 1, but preserves the distinct profiles of perceived relationship quality and intimacy among patients versus spouses.

Results dovetailed the gaze control and partner mutiny findings: Years from PD onset moderated the relationship between partner marital satisfaction and self–other differentiation on the attentional level (γ_{331} = .02, SE = .01), $t(132) = 1.99$, two-tailed $p < .05$ (see Table 2). Specifically, early after PD onset, there was a trending positive association between lower self–other differentiation and partner marital quality, whereas with more years from PD onset, a significant negative association between reduced self–other differentiation and partner marital satisfaction emerged, consistent with the suggestion that reduced self–other differentiation predicts poor relationship quality. Moreover, these findings highlight the potential adaptive value of increased self–other differentiation that minimizes the effect of emotional contagion from the patient's suffering to the caregiver in caregiving relationships (see Monin & Schulz, 2009).

Enmeshment, perceived lack of autonomy, and relationship quality. To investigate the hypothesis that poor gaze control predicts higher levels of enmeshment, which in turn predict poorer relationship outcomes, we ran two sets of analyses. To account for the interdependence in our dyadic data, the coefficients reported next were computed by entering in HLM the standardized values of the variables of interest and running two-level fixed slopes models (see L. Campbell & Kashy, 2002). These coefficients can be interpreted as traditional correlation coefficients.

First, as in Study 1, we found a significant negative association between the two partner ratings of relational dynamics and quality ($b = -.46$, SE = .24), $t(19) = -1.92$, one-tailed $p < .05$. Moreover, consistent with the adaptation effects revealed by the gaze control findings and conceptually replicating Study 1, we found a positive association between enmeshment and partner perceptions of lack of autonomy (after controlling for accuracy in inferring the shared and partner-unique thoughts and emotions experienced during the recalled event) among advanced-stage PD couples (b = .32, SE = .09), $t(22) = 3.46$, $p < .01$. In couples where the patient was in the more advanced stages of PD, we also replicated the negative association between enmeshment and partner ratings of marital satisfaction (controlling for relational intimacy; $b = -.43$, SE = .10), $t(19) = -4.45$, $p < .001$. Nevertheless, although the negative association between partner marital satisfaction and partner perceptions of lack of autonomy persisted for early stage PD couples, the associations between enmeshment and partner mutiny, as well as enmeshment and partner marital satisfaction, were reversed ($b = -.32$, SE = .09), $t(22) = -3.46$, $p < .01$, for enmeshment and partner mutiny; and (b = .43, SE = .10), $t(19) = 4.45$, $p < .001$, for marital satisfaction and enmeshment. Taken together, these findings suggest that in early stages of disability, increased focus on the unit of the couple may be beneficial for relationship functioning. Nevertheless, after the adaptation phase, for late-PD stage couples, enmeshment is associated with poor relational dynamics as found in Study 1's healthy elderly couples.

Next, we investigated whether the association between poor self–other differentiation on the attentional level and partner perceived loss of autonomy can be explained by the significant association of the latter with enmeshment levels. Using the same model as in Study 1 (see Equations 10 and 11), while also accounting for patient status, we found that enmeshment completely mediated the association between gaze control and partner perceptions of lack of autonomy. Specifically, when enmeshment and residual values of partner perceptions of autonomy were introduced simultaneously as predictors, the association between gaze control in the upright face condition and enmeshment remained significant, whereas the association between gaze control and partner mutiny became nonsignificant.

Finally, we examined whether the association between gaze control and partner ratings of marital satisfaction is explained through the association of the latter with (a) partner perceived loss of autonomy and (b) enmeshment. Because we used raw values of partner marital satisfaction and self and partner intimacy (which resulted in a larger number of variables from the previous analyses), and because we found no evidence of differential associations among enmeshment, marital satisfaction, and residual partner mutiny, we created four residuals. Residual 1 represented the unique variance of enmeshment, after accounting for the variance it shared with partner marital satisfaction. Residual 2 represented the unique variance of partner marital satisfaction, after accounting for the variance it shared with enmeshment. Residuals 3 and 4 represented the unique variance of partner marital satisfaction and residual partner mutiny, respectively, after accounting for their shared variance. Introducing these regression residuals in the same models as in Study 1 (see Equations 12–15, while controlling for relational intimacy), we replicated the respective Study 1 findings. Specifically, we found that enmeshment mediated completely the association between gaze control and partner marital satisfaction, in that Residual 1 still predicted gaze control, whereas Residual 2 did not. Moreover, we found that it was indeed the variance shared by partner marital satisfaction and residual partner mutiny that accounted for their association with gaze control, for when their unique variance scores were introduced as predictors of gaze control, they emerged as nonsignificant.

Study 2 thus extended Study 1 in several ways. First, we replicated the positive association between ToM abilities and gaze control in the upright face condition. Second, we demonstrated that the effect of self–other differentiation on relationship dynamics and quality follows a biphasic trajectory, consistent with previous work that postulates distinct socioemotional profiles associated with pre- and postadaptation to disability (see Lucas, 2007). Specifically, in early PD stages, increased self–other identification fosters more adaptive relational dynamics, consistent with previous studies demonstrating the beneficial effect of empathy in suffering-related situations (Monin & Schulz, 2009). In contrast, consistent with work suggesting adaptation to disability (even if the associated deleterious effects on hedonic balance persist; Lucas, 2007) with more years from onset, we replicated the negative effects of reduced self–other differentiation on relationship quality among advanced-stage PD patients and their spouses. That is, poor gaze control and a higher percentage of enmeshed (relative to differentiated) thoughts and emotions predicted heightened partner perceptions of lack of autonomy and poorer marital quality.

General Discussion

Inspired by clinical research showing that the inability to inhibit gaze-following behavior in response to situational demands predicts self–other differentiation failures at the cognitive-behavioral level (Frischen et al., 2007; Langdon et al., 2006), we investigated the effect of gaze control ability on both general and relationship-specific sociocognitive functioning in two studies involving healthy elderly couples and elderly PD patients and their spouses. Given that gaze cues linked to upright (but not inverted) faces trigger reflexive gaze-following mechanisms (Driver et al., 1999; Kingstone et al., 2000; Tipples, 2005), we used an upright face to assess social cuing mechanisms and an inverted face to assess nonsocial cuing mechanisms in a gaze control task. Paralleling research that used directional arrows as cues (Friesen et al., 2004), participants in both studies were generally able to override attentional cues associated with the inverted face. In contrast, replicating previous findings on the automaticity of gaze following, participants were generally unable to inhibit gaze following sufficiently to eliminate or reverse it when the cues were emitted by an upright (i.e., socially relevant) face. We therefore regarded gaze control failures in this condition as self–other differentiation failures on the attentional level (Frischen et al., 2007). We subsequently examined the link between gaze control ability and the ability to understand the mental states of generic others (i.e., ToM). We also examined whether attentional self–other differentiation failures would predict less self–partner differentiation and correspondingly greater dysfunctional relational patterns.

Complementing findings concerning the role of early relationship experiences in the emergence of gaze-following mechanisms (Hobson et al., 2004), we demonstrated a link between gaze control and relationship functioning in both studies. Specifically, we showed that gaze control is a dispositional perceptual predictor of enmeshment within a close relationship context—namely, the inability to differentiate one's own thoughts and emotions from those of a partner (Green & Werner, 1996). That is, spouses with poorer gaze control abilities reported a higher percentage of enmeshed ("we"-focused) relative to differentiated (self-focused or partner-focused) thoughts and emotions when recalling relationship events. They also were perceived by their partners as robbing the partners of a sense of autonomy, which predicted lower marital satisfaction among the latter. Moreover, it was the overlapping variance of gaze control and enmeshment that represented a significant predictor of relationship outcomes.

We extended these findings to PD patients and their spouses in Study 2. Consistent with the postulated existence of adaptive mechanisms that minimize the impact of disability (see Lucas, 2007), the inverse link between lack of self–other differentiation and relationship dynamics and quality was replicated among couples in which the patient had been diagnosed many years ago. In contrast, in the early years after diagnosis, reduced self–other differentiation seemed to be rather beneficial. In the early postdiagnosis years, patient and spouse may experience a heightened sense of differentiation—or even alienation—prompted by the patient's emerging neurocognitive degeneration. Increased self–other identification, as evidenced by increased vigilance and heightened focus on shared (vs. unique) cognitive-emotional states, may foster the health of the relationship during this period. Future research is needed to examine the underlying preadaptation to disability mechanisms that may foster relationship stability.

The present findings thus illustrate the apparently pivotal role of gaze control—a fundamental attentional process—in relational dynamics. The novelty of this is all the more striking given that gaze control predicted ability to understand the mental states of unspecified others (ToM), yet ToM abilities had a rather small impact on relational dynamics within well-established relationships (cf. Kilpatrick, Bissonnette, & Rusbult, 2002). Although our findings are perfectly compatible with clinical literature (Green & Werner, 1996; Langdon et al., 2006), the inverse association between partner marital satisfaction and self–other differentiation may seem to contradict social psychological work concerning self–other definition within relationships. In particular, Agnew, Rusbult, Van Lange, and Langston (1998) showed that strong commitment to a romantic relationship is associated with a high degree of cognitive interdependence—signified by tendencies to think about the relationship in a pluralistic (i.e., "we"-focused) manner, to perceive a high level of mental state overlap between self and partner, and to regard the relationship as a central component of what is significant in one's life.

This contradiction is apparent, not actual, for the two "we"-focused measures were quite different. Agnew et al. (1998) asked participants to share their thoughts about their current relationship—a global, semantic task that tapped aspects of the self-concept—or, more specifically, of the self-in-relationship concept. In contrast, our participants were asked to recall specific relationship events, re-experience their own thoughts and emotions, and "guess" what their partner may have experienced then. This is an episodic memory task (see Levine, Svoboda, Hay, Moscovitch, & Winocur, 2002): A higher proportion of "we"-focused (vs. self-focused or partner-focused) thoughts and emotions in this context implies a fusion of the two partners' distinct subjective experiences within the mind of the re-experiencer and, thus, a failure to acknowledge the experiential autonomy of both partners. Viewed in this way, the inverse relationship between marital satisfaction and "we"-focused thoughts and emotions is broadly in line with other research (Slatcher, Vazire, & Pennebaker, 2008) incorporating tasks of a more episodic nature (e.g., instant messages) that found an association between frequency of 'I' statements (reflecting a sense of autonomy) and relationship satisfaction and stability among women.

Nevertheless, the inverse association between relationship quality and self–other differentiation failures at both an attentional and autobiographical memory level deserves additional exploration. Recall that we found an association between gaze control failures and partner's perceptions of loss of autonomy even after accounting for both spouses' explicit patterns of dysfunctional interaction (i.e., wherein one spouse attempts to control the other, and the receiving partner perceives these manipulation attempts as blows to his or her sense of autonomy). Enmeshment-related behaviors may therefore also manifest subtly and benignly—as being overly responsive to a partner's needs, for example (cf. Study 2 wherein, perhaps by helping the newly diagnosed PD patient and spouse overcome the divergence in their subjective experience, enmeshment of attention and memory were linked to relationship stability).

Although we focused on the salutary relational effects of inhibitory gaze control, the latter was explicitly framed as a functional response by instructing participants that task success would be maximized by looking opposite the directed gaze. Study 2 provided preliminary evidence that, in the real world, the utility of such contrariness is situation-dependent. Sensitivity to gaze cues, likely to foster emotion contagion and empathy, and the associated reduction in self–partner differentiation, may be beneficial when one partner struggles with a traumatic personal event, such as the diagnosis of a degenerative disorder, and the shared reality of the two partners is destabilized. Research concerning the boundary conditions of beneficial effects of self–other differentiation versus identification on relationship functioning is advised.

The present research demonstrated a link between individual differences in social-perceptual processes and both global and relationship-specific sociocognitive functioning. We hope that future research will provide a better understanding of how social perception and social-cognitive mechanisms interact to construct a sense of shared reality and provide the ground for pursuit of shared and individual goals in the context of long-term close relationships.

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