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Gender differences in older adults' everyday cognitive collaboration

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Abstract

Collaborative cognition research has demonstrated that social partners can positively impact individuals' thinking and problem-solving performance. Research in adulthood and aging has been less clear about dyadic effects, such as partner gender, on collaborative cognition. The current study examined the objective and subjective experiences of older men and women's collaboration on three everyday problems. Tasks included comprehension of everyday printed materials, a social dilemma task, and an errand-planning task. A sample of 98 older married couples ($N = 196$) worked both collaboratively and individually with either their spouse ($N = 52$ dyads) or a stranger of the other gender ($N = 46$ dyads). Analyses conducted using the actor-partner methodology (e.g., Gonzalez & Griffin, 1997; Kenny, 1996) suggest that men tended to be more influential during dyadic problem solving, particularly on more ambiguous tasks. Subjective appraisals of collaboration also varied between male and female partners, with familiarity of partner playing a large role in expectations of collaboration. Most notably, women assigned to work with an unfamiliar male partner tended to rate their satisfaction with collaborative teamwork less positively. Both self and partner-rated subjective appraisals, particularly expectations of competitiveness, were predictive of collaborative performance.

A growing body of research suggests that the benefits of cognitive collaboration extend into older adulthood, and elders have exhibited collaborative benefit on tasks such as prose recall (e.g., Dixon & Gould, 1996; Gould & Dixon, 1993) and wisdom-related advice giving (Staudinger & Baltes, 1996). The collaborative approach is particularly relevant to older adulthood as much of cognition in everyday life occurs with social partners and collaborative strategies may be used as compensatory mechanisms to help ameliorate normative age-related declines in cognition (Bäckman & Dixon, 1992; Marsiske, Lang, Baltes, & Baltes, 1995). One aspect of collaboration that has begun to be addressed in the adulthood and aging literature is consideration of the factors that impact collaborative outcomes. Partner gender may be a particularly important influence on collaborative interaction and outcome.

Given that prior gerontological studies have not explicitly investigated potential differential effects of collaboration on partners, the current study examined whether men and women were equally influential in determining cognitive collaboration outcome. In addition, this study sought to determine whether or not subjective expectations and evaluations of the collaboration made prior to and immediately following collaborative interaction, varied

between male and female partners. The study also investigated whether subjective appraisals made by male and female partners were predictive of collaborative performance.

Gender differences: Potential impact on collaborative appraisals and outcome

Gender differences in interaction style, response to partner gender and familiarity, cognitive performance, and perceived task familiarity and relevance may impact interaction between older adult male and female collaborative partners and consequently the objective and subjective experience of each partner.

Interaction style—The social psychological literature suggests that one caveat affecting collaborative outcome is gender beliefs and behaviours that may be evident in the interaction style of male and female partners during collaboration. Beginning at an early age, males and females behave differently in social situations (e.g., frequency and duration of social interaction, preference for dyadic and group activities; Benenson, Apostoleris, & Parnass, 1997), and an individual's gender or gender-typed behaviour, can impact dyadic and group interaction processes and outcomes. Maccoby (1990) suggests that patterns learned in very early childhood with same-gender social partners carry over into later parts of the life span. This may put women at a disadvantage when they utilise learned same-gender behaviour patterns in mixed-gender social situations, as males tend to be less responsive to females' influence behaviours (Maccoby, 1990).

Men are more likely to take a leadership role in social interactions (Kolb, 1997) and rely on more authoritarian techniques (Kirchler, 1993) than women. In the absence of cues regarding partner task competency, men tend to exhibit more active task behaviours, whereas women tend to demonstrate more positive social behaviours (Wood & Karten, 1986; Wood, Polek, & Aiken, 1985). Shackelford, Wood, and Worchel (1996) found that women could increase their influence in a mixed-gender group by demonstrating exceptional task competency early in group history. Some research suggests that men and women's interaction styles can benefit performance on different types of tasks. In a review of studies examining gender differences in group performance, Wood (1987) concluded that, in general, the interaction styles of female group members appeared to facilitate performance on tasks requiring more social activity and group consensus (e.g., more than one correct method of solution exists); whereas male group members' interaction styles appeared to facilitate performance on tasks which required generation of one correct solution.

Partner gender and familiarity—Research examining education, learning, and cognition suggests that males and females are likely to behave and perform differently in same-gender versus mixed-gender groups. For example, educational research suggests that females benefit more from same-gender learning environments (see Lee & Marks, 1990). Research examining cognitive task performance has demonstrated that partner gender can affect interaction and performance. For instance, in a study of computer-based problem solving, Barbieri and Light (1992) found that males tended to be more dominant in same-gender and mixed-gender pairings compared to females, and males demonstrated an overall performance advantage; whereas females in same-gender pairings tended to promote the most turn taking. In a study examining young adults' completion of a computer task, Corston and Colman (1996) found that females generally performed much better on the task when in the presence of a non-interacting female audience member than when performing either alone or in front of a male audience member. Conversely, males experienced a slight social facilitation effect when performing in front of a female audience member and exhibited almost no social facilitative effect when performing in front of a male audience member. In related research, Light and colleagues (Light, Littleton, Bale, Joiner, & Messer, 2000) examined the performance of co-acting pairs (i.e., pairs which were not permitted to

collaborate) and interactive collaborative pairs. In one study examining non-interactive, co-acting pairs (comprised of same-gender and mixed-gender pairs), boys tended to perform better than girls in all pairings with the most pronounced differences exhibited by mixed-gender pairings. Girls in co-acting, same-gender pairings spent more time on information searching and performed better than girls working alongside a male partner (Light et al., 2000). In a second study, co-acting mixed-gender pairs exhibited the same performance difference; however, the interacting collaborative mixed-gender pairs did not exhibit gender differences in performance. Thus, prior work suggests a complex picture where partner gender may have differential effects for male and female partners and that the effects may differ for co-acting versus interactive pairs. Although not explicitly examined in collaborative cognition studies with older adults, dyadic gender composition may affect collaborative outcomes in later life, particularly given more rigid gender roles often found in older cohorts.

In addition to gender, partner familiarity also appears to play an important role in cognitive collaboration. Gould, Kurzman, and Dixon (1994) found that partner unfamiliarity, or working with a stranger, was related to older adults' lower performance on a prose recall task. In two studies of transactive memory, Andersson and Rönnerberg (1995, 1996) compared the recall performance of dyads comprised of familiar partners (i.e., friends with a one-year minimum work history on similar tasks) to dyads comprised of unfamiliar partners. Although dyads in general exhibited reduced productivity on memory recall tasks compared to individuals, working with a familiar partner appeared to reduce some of the performance loss typically associated with collaborative recall on selected memory tasks (Andersson & Rönnerberg, 1995, 1996).

Cognitive task performance—In addition to differences in interaction and interpersonal style, gender differences in the observed performance of cognitive tasks may also influence cognitive collaboration in older dyads. There is evidence from the earlier parts of the life span, particularly reviews and meta-analytic studies, which suggests that gender differences in cognitive performance exist. The literature examining cognitive performance differences in young adulthood suggests that females tend to perform better on verbal and perceptual speed tasks (Halpern, 1997), whereas males generally perform at higher levels on most tasks involving transformation of visual-spatial working memory (Halpern, 1997; Masters & Sanders, 1993; Voyer, Voyer, & Bryden, 1995).

The magnitude and meaningfulness of these differences has been debated (e.g., Archer, 1996; Eagly, 1995; Lott, 1996) and inconsistent evidence of gender differences in cognitive performance has been reported. In a meta-analysis conducted by Hyde and Linn (1988) females were found to have a slight advantage over males in verbal ability, however, the magnitude of the effect was small. In a large-scale study examining performance on standardised aptitude tests, Feingold (1988) found results similar to the meta-analyses previously reported; however, no significant gender differences were observed on verbal reasoning, arithmetic, and figural reasoning performance. In a study of adults aged 20 to 74, Kaufman and colleagues did not find significant gender differences for the WAIS-R Verbal and Performance scales (Kaufman, Kaufman-Packer, McLean, & Reynolds, 1991). Additionally, some research suggests that gender differences are decreasing in recent cohorts (Feingold, 1988), although these findings have also been debated (Halpern, 1989).

Much less research has examined the trajectories of men and women's cognitive performance in middle and later adulthood. Although some evidence exists that older married spouses' cognitive abilities tend to become more similar over time (Gruber-Baldini, Schaie, & Willis, 1995), research on normal cognitive aging suggests that mean level gender differences in cognitive performance on selected tasks continue to be evident throughout the

life span. Rabbitt and colleagues (Rabbitt, Donlan, Watson, & McInnes, 1995) found that women generally performed better than men on word definition, verbal memory, and verbal learning tests; whereas men tended to perform better on a spatial reasoning test. In a study of older adults' serial rote learning, Wilkie and Eisdorfer (1977) found that males of average verbal ability performed more poorly than their female counterparts during fast-paced stimuli presentation. Gender differences in spatial memory favouring males were found in a study examining verbal and spatial immediate memory performance of young, middle-aged, and older adults (Orsini et al., 1986). Willis and Schaie (1988) found that a gender difference favouring men on spatial ability performance was relatively stable over a 14-year period for persons who had demonstrated reliable spatial ability decline. Other research suggests that gender differences in adult cognitive performance exist in the strategies employed by men and women to solve tasks such as reasoning and route planning (Brown, Lahar, & Mosley, 1998; Galea & Kimura, 1993).

Thus, some gender differences in cognitive performance appear to exist in older adulthood although the magnitude of these differences appears to be modest and possibly amenable to intervention (Willis & Schaie, 1988). In addition, gender differences in older age may be significant, but possess less utility in explaining individual performance differences compared to age (Crook & West, 1990; West, Crook, & Barron, 1992) and other individual variables may interact with gender (Rabbitt et al., 1995).

Cognitive task relevance and familiarity—Men and women may also differ in their actual, as well as perceived preference, for certain cognitive/everyday tasks. These preferences and perceptions may be due in part to men and women's socialisation and adoption of gender roles and/or familiarity with selected tasks—both of which are likely to be evident in older cohorts. Prior research suggests that men and women may differ in choice of tasks and work group compositions (Vancouver & Ilgen, 1989) and exhibit varying social behaviours depending on the nature of the task at hand; with male and female partners exhibiting more influential behaviours during relevant gender-typed activities and tasks (Dovidio, Brown, Heltman, Ellyson, & Keating, 1988).

Related to task familiarity, and relevant to the current study, is prior work pertaining to gender differences in social relations. Specifically, women tend to be more oriented towards interdependence than men (e.g., Cross & Madson, 1997), are more apt actively to maintain close interpersonal relationships throughout their lives (Antonucci, 1994), and are more likely to report everyday problems of an interpersonal nature as more salient compared to men (Strough, Berg, & Sansome, 1996). Thus, women may be more likely to have greater experience with interpersonal relationships than men and be more concerned with relationship maintenance—both of which could translate into an advantage in the present study which examines performance on a social dilemma task.

Study rationale

Given prior research suggesting that the collaborative experience could vary differentially for male and female partners, the current study sought specifically to address the influence of gender on the objective and subjective experiences of cognitive collaboration by examining three primary research questions. First, were men and women equally influential in determining collaborative problem solving outcome? Specifically, were men and women's individual scores equally predictive of their own collaborative performance (i.e., how much did each person "listen to themselves") as well as their partner's collaborative performance (i.e., how much did each person influence his or her partner). Of interest were any tendencies for one partner to influence the collaborative outcome significantly more than the other partner.

A corollary to this question was examination of any potential differences in the objective performance and collaborative benefit of male and female partners. It was believed that influence over the collaborative outcome would be related to cognitive task demands, task familiarity, and perceived gender relevance of the everyday tasks (Dovidio et al., 1988; Vancouver & Ilgen, 1989). It was hypothesised that women would be more likely to take the lead, and thus be more influential, on a social dilemmas task because the task (1) focused on interpersonal relationships and was likely to be more salient and familiar to women (Strough et al., 1996) and (2) required generation of multiple high-quality solutions judged to be safe and effective (Wood et al., 1985); whereas men were thought to be more likely take the lead on an errand planning task because the task relied heavily on spatial orientation skill (Halpern, 1997). Men and women were expected to be equally influential during a highly structured task involving comprehension of familiar everyday materials taken from a variety of domains linked to both genders (e.g., medication usage, consumerism).

The second research question examined potential differences in male and female partners' subjective experience of cognitive collaboration, namely their expectations and evaluations of their satisfaction with collaborative teamwork and perception of competitiveness during the interaction. Due to their history of "couple expertise" (Dixon & Gould, 1996), it was hypothesised that men and women assigned to work with a familiar partner, (i.e., their spouse) would rate the collaborative teamwork as more satisfying and less competitive than those individuals assigned to work with an unfamiliar partner (i.e., a stranger of the other gender).

In order to examine the link between objective and subjective experience, the final research aim investigated the relationship between self and partner-rated subjective appraisals and collaborative performance. Collaborative expectations, particularly self-rated expectations, were expected to be predictive of collaborative outcome.

Method

Design

The design of this experiment involved two within-subjects factors (i.e., Work Alone/ Collaborative and Task) and two between-subjects factors (i.e., Dyad Familiarity and Order). Thus, each of the participants ($N = 196$) completed all three types of problem-solving tasks (i.e., Task factor) independently (i.e., Work Alone condition) and in dyads (i.e., the Collaborative condition). The first between-subjects factor, Dyad Familiarity, represented the assignment of participants to work with either a familiar partner (i.e., their spouse) or an unfamiliar partner (i.e., a stranger) of the other gender. The second between-subjects factor, Order, referred to the fact that 50% of dyads were randomly assigned to the Work Alone condition first, and 50% were assigned to work in the Collaborative condition first.

Participants

Participants were 98 older adult married couples ($N = 196$ individuals) recruited from both urban and suburban community settings in the Detroit/Ann Arbor, Michigan metropolitan area in the USA. Participants were recruited through a variety of methods and received a \$20 honorarium for their participation. To be eligible for the study, couples were required to meet several criteria. First, the minimum mean couple age was set at 60 years of age (with a lower bound individual age of 55 for one spouse), as this defines the age range at which some cognitive declines become normative (Schaie, 1994). Second, to reduce and control for between-dyad differences and ensure well-established marital interaction patterns (e.g., Cartensen, Levenson, & Gottman, 1995), couples were required to be cohabiting and legally

married for at least 15 years. Third, participants were screened for impairment in three specific activities of daily living (ADLs; i.e., bathing, dressing, and personal hygiene; Katz, Ford, Moskowitz, Jackson, & Jaffee, 1963; Morris, 1997) to ensure that collaborative patterns were not biased toward a caregiver–care recipient relationship due to the infirmities of an impaired spouse. Finally, to adhere to the experimental design, both members of the couple needed to pass the screening criteria and agree to participate.

On average, participants were almost 73 years of age ($M = 72.90$, range = 59–88, $SD = 5.89$) and length of current marriage was almost 46 years ($M = 45.81$, range = 15–65, $SD = 9.78$). The average educational attainment ($M = 15.69$, range = 9–22 years, $SD = 2.85$) and yearly income ($M = \$40,419$, range = \$2000–50,000, $SD = \$11,430$) were relatively high, although there was substantial variation. The ethnic composition of the sample mirrored the larger Detroit/Ann Arbor community of adults aged 60 years and older (Database C90STF3C1, US Census Bureau, 1990): 79% were White, 20% were African American, and 1% reported a multi-ethnic background.

Measures

EVERYDAY PROBLEM-SOLVING TASKS: PRIMARY OUTCOME VARIABLES—

The three tasks of everyday problem solving represented an instrumental task (i.e., highly structured, unambiguous task requiring one solution), a social task involving interpersonal dilemmas (i.e., less structured task for which numerous solutions were possible), and a route-planning task, which incorporated both instrumental and social components.

Everyday Problems Test: The Everyday Problems Test (Willis & Marsiske, 1993) was designed to assess older adults' ability to solve problems in critical everyday printed materials domains (i.e., Instrumental Activities of Daily Living; Lawton & Brody, 1969), such as health and medication use, financial management, and housekeeping/laundry. Two parallel 14-item forms were created from a 28-item short-form version of the Everyday Problems Test using pilot data from a separate study (Jobe et al., in press). The open-ended version of the Everyday Problems Test was administered to allow for maximum dyadic interaction. Participants were presented with a stimulus (i.e., a medication label) and asked to solve age-relevant problems associated with that stimulus (e.g., calculating how many pills to take over a two-day period). Performance on the Everyday Problems Test was assessed by the total number of items answered correctly. An experienced, trained coder scored all Everyday Problems Test protocols, and a second coder scored a random subsample of 20% of Collaborative protocols. There was no significant difference between the ratings of the two coders, $t(20) = -1.00$, $p = .33$, and the correlation between their ratings was excellent, $r = 1.00$. The internal consistency of each form (computed from the Work Alone phase) was satisfactory, Form 1: $\alpha = .77$; Form 2: $\alpha = .70$.

Everyday Problem-Solving Inventory: The original Everyday Problem-Solving Inventory (Cornelius & Caspi, 1987) consisted of 48 short vignette-type items depicting social problems, in two parallel 24-item forms. The Everyday Problem-Solving Inventory vignettes were developed to represent prototypical problems faced by adults in the domains of economic consumerism, complex information, home management, family, friends, and work. For the purposes of this study, two forms of the Everyday Problem-Solving Inventory were developed and each was constructed of six items, each item representing one of the six problem domains.

Participants were instructed to generate as many safe and effective solutions to each problem as possible (see Denney & Pearce, 1989; Marsiske & Willis, 1995) and were directed to move to the next vignette only after exhausting all possible solutions. Performance was assessed by the total number of safe and effective solutions provided by participants.

Protocols were scored by a trained coder experienced with Everyday Problem-Solving Inventory coding. Inter-rater reliability was calculated on a random 20% subsample of Collaborative protocols. There was no significant difference between the two raters, $t(20) = 2.03$, $p = .06$, and the correlation between their ratings was high, $r = .98$. Internal consistency of each form (computed from the Work Alone phase) was also high, Form 1: $\alpha = .85$; Form 2 $\alpha = .86$.

Errand-Planning Task: The Errand-Planning Task was based on the prior work of Radziszewska and Rogoff (1988, 1991) who have used the task with children (see Berg, Meegan, & Johnson, 1995 for use with older adults). In all trials, each participant was provided with a list of errands, instructions concerning purchasing restrictions, and a fictitious city map. Participants were instructed to devise a plan to complete their errands in the most efficient manner possible. Parallel forms were created by randomly pairing the four 5-item lists used by Radziszewska and Rogoff (1988, 1991), which resulted in two parallel 10-item forms.

Three indicators of errand planning performance were tabulated: total number of blocks travelled in the route; total number of correct stops; and total number of unnecessary stops. Overall errand-planning performance was assessed by an efficiency composite comprised of:

$$\text{Efficiency Score} = \frac{(\text{number of correct stops} - \text{number of unnecessary stops})}{\text{total number of blocks traversed in the solution}}$$

Errand protocols were scored by two trained raters. Their inter-rater reliability was calculated on a random 20% subsample of protocols. There were no significant differences between the raters' scores: Number of blocks: $t(19) = 1.71$, $p = .10$; Correct stops: $t(19) = 0.57$, $p = .58$; Unnecessary stops: $t(19) = -0.37$, $p = .72$; Overall efficiency score: $t(19) = -0.19$, $p = .85$. The correlation between raters was high: Number of blocks: $r = .89$; Correct stops: $r = .86$; Unnecessary stops: $r = .67$; Overall efficiency score: $r = .74$.

PROBLEM-SOLVING MEASURES: STANDARDISATION AND RELATIONSHIPS

—In order to permit comparisons across tasks, the Work Alone performance score for each problem-solving task was standardised to *T-score metric* ($M = 50$, $SD = 10$), and Collaborative scores were standardised to *T-score metric* using the *Work Alone* mean and standard deviation as the base, thereby preserving any mean or variance differences over the two conditions. Higher scores on each measure were indicative of better performance. Bivariate correlations between the three problem-solving measures were significant and indicated that the measures were moderately related: Work Alone condition (r range = .31–.56); Collaborative condition (r range = .34–.45). The intraclass correlations were significant and indicated a moderate relationship for the Work Alone scores (r range = .31–.48). As expected, the intraclass correlations for the Collaborative scores were significant (r range = .66–.83) and of a larger magnitude than the Work Alone intraclass correlations, indicating that the experimental manipulation was successful.

SUBJECTIVE APPRAISALS

Overall collaborative expectations and evaluations: Expectations of overall collaborative experience were administered prior to collaboration. Expectations were assessed with a total of five items. The same items were re-administered after the collaborative interaction, representing post-facto evaluations of collaboration. Questions asked respondents to rate their expected and actual (1) satisfaction with their own performance; (2) satisfaction with their partner's performance; (3) perception of collaboration; (4) perception of competition

during the interaction; and (5) enjoyment of the interaction. Both collaborative partners rated their collaborative expectations and evaluations on a five-point Likert scale (high scores indicated greater levels of endorsement). These items were domain-general and focused on collaboration across the three everyday problem-solving domains.

A factor analysis, using varimax rotation, found that the items clustered into a general “satisfaction with collaborative teamwork” factor and a single-item “competitiveness” variable. The same structure held for the post-collaboration evaluation. The two satisfaction subscales (i.e., Expectation of Satisfaction with Collaborative Teamwork and Evaluation of Satisfaction with Collaborative Teamwork) were comprised of the mean of four items gauging respondents’ satisfaction with their own and their partner’s performance, the degree of collaboration, and enjoyment of the interaction. Scores on the Expectation of Satisfaction with Collaborative Teamwork subscale ranged from 2.3 to 5.0 and the Evaluation of Satisfaction with Collaborative Teamwork ranged from 2.0 to 5.0. The two competitiveness subscales (i.e., Expectation of Competitiveness and Evaluation of Competitiveness) were each comprised of a single item, which asked respondents to rate the overall level of competitiveness during the interaction (ranges = 1–5).

Task-specific expectations: Participants also rated their expectations of collaboration on the three tasks. Prior to the collaborative interaction, participants rated the expected percentage correct and how well the collaboration would go (1 = “Not very well” to 5 = “Very well”).

Procedure

For each testing session two couples, matched on ethnicity, age (i.e., mean couple age within 10 years), and socioeconomic status (i.e., one social strata on the Hollingshead, 1971, 1975) were recruited. Prior to appearing for testing, this tetrad of participants was randomly assigned to either work with their own spouse (Familiar condition) or with a stranger of the other gender (Unfamiliar condition). Participants attended a single three-hour testing session that consisted of two testing components with different measurement objectives; a *Baseline* segment and a *Problem-Solving* segment.

The Baseline segment of the session was always administered first, allowing the couples to meet. All four participants worked in a common space, and completed a battery of demographic and basic ability measures. At the conclusion of the baseline segment, participants were separated into two dyads (both dyads either married or unfamiliar) and taken to separate rooms.

Dyads then engaged in a brief conversation before the Problem-Solving segment of the study. During the Problem-Solving segment, all participants completed each of the three measures of everyday problem solving both with a partner (i.e., *Collaborative* phase) and alone (i.e., *Work Alone* phase). Participants completed the three problem-solving measures in one of the six possible orders; performance on the measures did not significantly vary according to order of the problem-solving measures.

In the Collaborative phase, two partners worked together and this portion of the session was videotaped. Participants were instructed to work together to discuss the problem, then write down their *own* responses to each item; participants generally recorded their answers after discussion of each item. There were no time limits or constraints placed on dyads regarding the level of collaborative interaction. Theoretically, this procedure permitted partners to disagree and glean what they wished from the collaboration. Analytically, this procedure allows for analyses to be conducted at either the individual or dyadic level. To control for the effect of merely being in the same room with someone during the Collaborative phase,

dyad members also worked on problems in the same room as their assigned partner during the Work Alone phase. During the Work Alone phase, participants received explicit written and verbal instructions not to speak or collaborate in any way on the tasks with their dyad partner. Frequent checks (i.e., approximately every 10 minutes) by the researcher were also used to monitor unwanted collaboration during Work Alone problem solving. Again, participants were instructed to write their own answers to the presented problems. The order of problem-solving condition (i.e., Collaborative or Work Alone) was counterbalanced across dyads. Fifty percent of dyads began working alone on the problem-solving tasks first, followed by collaborative work second. The remaining 50% were tested in the opposite order.

Results

The first set of analyses investigated the influence of male and female partners on their own and their partner's cognitive performance during the collaborative problem-solving condition. The second set of analyses examined women and men's overall subjective expectations and evaluations of the collaborative interaction, as well as task-specific expectations. The final set of analyses examined the relationship of self and partner-rated subjective appraisals and collaborative performance.

Influence of gender on collaborative outcome: Examination of the actor/partner model

The first set of analyses utilised a methodology that examines one's own performance (i.e., the "actor" effect) in relation to another person (i.e., the "partner effect;" e.g., Gonzalez & Griffin, 1997; Kenny, 1996; Kraemer & Jacklin, 1979; Murray, Holmes, & Griffin, 1996a, b; Thibaut & Kelley, 1959). Structural equation modelling (using observed variables) is utilised in the actor-partner approach as it has two advantages. First, structural equation modelling, using maximum likelihood procedure, allows the simultaneous estimation of path coefficients in a number of different equations. This permits statistical indexing of the *unique* effects of a participant's individual performance on his or her own collaborative performance (actor effect), as well as concurrent examination of the collaborative partner's *unique* influence on that participant's collaborative performance (partner effect). A basic model is depicted in Figure 1.

A second advantage of using structural equation modelling is the ability to test the fit of competing models. In the current study this permits us to test for possible gender differences in path models, allowing us to investigate whether men and women are equally influential in the collaborative situation. This question is tested by comparing a model that estimates equal "partner influence" coefficients for men and women to the fit of a model that estimates unequal "partner influence" coefficients. Similarly, the fit of a model that estimates equal "actor influence" coefficients is compared to a model that estimates unequal "actor influence" coefficients for men and women. A basic model was tested for each problem-solving measure (i.e., Everyday Problems Test, Everyday Problem-Solving Inventory, Errand Planning Task). This initial model (MOD1) was the most restrictive model, in which both the actor ("self influence") and partner ("partner influence") coefficients were constrained to equality for males and females. Three modifications were tested, allowing for a nested models comparison: In MOD2, only the partner influence was constrained to equality for males and females; a third model, MOD3, constrained only the actor influence to equality for males and females; and lastly, the least restrictive model, MOD4, allowed the actor and partner influences to vary freely.

Initially, the adequacy of each model fit was considered. Adequate model fit was determined by examination of several goodness of fit statistics to assess if each index was within a desired range (i.e., Goodness-of-Fit Index, Comparative Fit Index, Normed Fit Index, Non-

Normed Fit Index, Incremental Fit Index, minimum values $> .90$; Root Mean Square Error of Approximation and Root Mean Residual, approximate maximum values $< .05$; Byrne, 1998). After determination of adequate model fit, a chi-square difference test was conducted to determine if any of the less restrictive models (MOD2–4) provided a significantly better fit than the most restrictive model (MOD1; Murray et al., 1996a). Acceptance of a less restrictive model was also premised on maintenance or improvement of model fit indices. If more than one of the less restrictive models provided a significantly better fit than MOD1, a second chi-square difference test between these models was conducted to determine the most appropriate model.

EVERYDAY PROBLEMS TEST—Table 1 depicts the fit of the basic model, as well as the fit for each of the three modified models, tested for the Everyday Problems Test (EPT). As shown, MOD EPT2, MOD EPT3, and MOD EPT4 did not fit significantly better than MOD EPT1, the most restrictive model, suggesting that both actor and partner influences were equivalent for males and females. As seen in Figure 2, the most important influence on collaborative performance was the actor's performance in the Work Alone condition: the better the performance when working alone, the better the collaborative performance. There was a small but significant influence of the actor's partner: The better the actor's partner worked when alone, the better the actor's own performance in the collaborative situation. In the case of the Everyday Problems Test, which is an instrumental task spanning several everyday problem domains and requiring a single unambiguous answer, males and females exerted equal influence on each other in the collaborative situation.

EVERYDAY PROBLEM-SOLVING INVENTORY—An analogous actor/partner model and three modified models were tested for the Everyday Problem-Solving Inventory (EPSI; see Table 2). In the case of the Everyday Problem-Solving Inventory, the least restrictive model, MOD EPSI4, was a significant improvement in model fit over MOD EPSI1, the most restrictive model. This suggests that actor and partner influences differed for males and females, and should be allowed to vary freely in the model. This is illustrated by the final path coefficients shown in Figure 3. For both males and females, the actor's own performance in the Work Alone condition was a significant predictor of collaborative performance, however, this relationship was stronger for men. For both men and women, partner's influence on collaborative performance was also significant, although for women the magnitude of the relationship with partner influence was much stronger. Taken together, these relationships suggest that men were the more influential partners, both on themselves and on their partner, during this social, relatively unstructured, collaborative task with more than one correct solution.

ERRAND-PLANNING TASK—The basic actor/partner model and three modified models were again run for the Errand-Planning Task (ERR; see Table 3). Two of the less restrictive models, MOD ERR2 and MOD ERR4, provided significantly better model fits than the most restrictive MOD ERR1, which constrained both actor and partner effects to equality for males and females. A chi-square difference test revealed that the least restrictive model, MOD ERR4, which allowed partner and actor influences to vary freely did not provide a significantly better fit than MOD ERR2, which allowed only the actor influences to freely vary; χ^2 diff. (1, $N = 90$) = .72, $p > .05$. This suggests that only the actor influences differed between males and females; thus MOD ERR2 was selected as the final model. As shown in Figure 4, actor influence on collaborative performance was significant, and particularly strong for the men. This suggests that males were more likely to use their own judgement during collaborative performance on the Errand-Planning Task.

INFLUENCE OF GENDER ON PROBLEM-SOLVING PERFORMANCE—In addition to comparing male and female influence patterns, a corollary question was whether one gender exhibited superior performance during problem solving. Follow-up *t*-test comparisons were conducted to determine if male and female individual and collaborative performance differed on the three problem-solving measures (see Table 4). First, we compared men and women *working alone*, on each of the three measures. Men and women significantly differed only on the Everyday Problem-Solving Inventory. Next, we compared men and women *working together*, on each of the three measures. Here, there were no significant differences (Bonferroni-adjusted $\alpha = .008$), although there was some indication that women scored higher than men on the Everyday Problem-Solving Inventory. Thus, men and women were quite evenly matched, and if anything, collaboration seemed to eradicate whatever small gender differences there might have been.

Gender differences in subjective appraisals of collaboration

The next section examines men and women's subjective collaborative appraisals. Collaborators rated their expectations and evaluations of the collaborative interaction overall, as well as expectations about collaboration on specific tasks. Analyses were conducted on a subsample of participants with complete self and partner-rated subjective appraisal ratings ($N = 178$).

OVERALL EXPECTATIONS AND EVALUATIONS OF COLLABORATION—A 2 (*Gender*: Male, Female) $\times$ 2 (*Dyad Familiarity*: Familiar spouse, Unfamiliar stranger) $\times$ 2 (*Order*: Work Alone first, Collaboration first) $\times$ 2 (*Appraisal Type*: Satisfaction With Collaborative Teamwork, Competitiveness) $\times$ 2 (*Time of Appraisal*: Expectation, Evaluation) repeated-measures MANOVA was used to examine domain-general collaborative expectations and evaluations. The MANOVA revealed a significant four-way interaction of Time of Appraisal by Appraisal Type by Dyad Familiarity by Gender, $F(1, 169) = 4.32, p = .04$. There was also a significant two-way interaction between Appraisal Type and Familiarity, $F(1, 169) = 4.77, p = .03$, and a two-way interaction between Appraisal Type and Gender, $F(1, 169) = 4.47, p = .04$. To better understand the four-way interaction, *t*-tests were conducted within each appraisal type and time (see Table 5).

Expectations: In terms of significant differences, men in the familiar condition rated their expectations of satisfaction with collaborative teamwork significantly higher than both men and women in the unfamiliar condition. Women in the familiar condition also rated their expectations of satisfaction with collaborative teamwork significantly higher than men in the unfamiliar condition, and there was also some suggestion ($p < .10$) that this was also true of women in the unfamiliar condition. Thus, men and women in the familiar condition generally held higher expectations of satisfaction with collaborative teamwork than men and women in the unfamiliar condition (see Table 5). In terms of expectations of competitiveness, women in the unfamiliar condition tended to rate their expectations higher than men in the familiar condition; however, this difference was indicated by a trend ($p < .10$).

Evaluations: Women working with an unfamiliar partner rated their satisfaction with collaborative teamwork as significantly less positive than men and women in the familiar condition (see Table 5). There were also two trends ($p < .10$) indicating that women working with an unfamiliar male partner tended to view their satisfaction with collaborative teamwork as less positive and the collaboration as more competitive compared to men working with an unfamiliar female partner (see Table 5).

TASK-SPECIFIC APPRAISALS—Table 6 depicts the group means for the task-specific expectations (i.e., expected percentage correct, collaborative expectation). In general, participants expected to get approximately 84% or more of the items correct on each problem-solving measure. Task-specific collaborative expectations were high (i.e., $M = 3.95$ – 4.50), indicating that participants expected to work well or very well together during the collaboration.

A 2 (*Gender*: Male, Female) $\times$ 2 (*Dyad Familiarity*: Familiar spouse, Unfamiliar stranger) $\times$ 2 (*Order*: Work Alone first, Collaboration first) $\times$ 3 *Appraisal Type*: Expected Percentage Correct, Expected Percentage of Teamwork, Collaborative Expectation $\times$ 3 (*Measure*: Everyday Problems Test, Everyday Problem-Solving Inventory, Errand Planning) repeated-measures MANOVA was performed to examine the task-specific expectations. There was a significant Appraisal Type by Measure interaction, $F(2, 168) = 6.83, p = .001$; however, there were no significant differences based on gender or partner familiarity.

T-tests were conducted to examine the two-way interaction. For the total sample, participants expected to get a significantly lower percentage of Everyday Problem-Solving Inventory items correct (85.38%) compared to the Everyday Problems Test (90.38%) and the Errand Planning task (88.13%). Participants expected to collaborate better with their partner on the Everyday Problems Test ($M = 4.40$) compared to the Everyday Problem-Solving Inventory ($M = 4.12$) and Errand-Planning Task ($M = 4.13$).

Self and partner collaborative subjective appraisals and performance

Hierarchical regression analysis was conducted for each problem-solving measure to examine the predictive utility of subjective appraisals. Analyses were conducted on a subsample of participants with complete self and partner-rated subjective appraisals ($N = 178$). The two design factors (Partner Familiarity, Gender) were entered in step one. The two task-specific self-rated subjective appraisals (Collaborative Expectation, Percentage Expected to be Correct) and two self-reported overall collaborative expectations (Expectation of Satisfaction with Teamwork, Expectation of Competitiveness) were entered in step two. The final step included partner's subjective appraisals and were analogous to the predictors in step two.

The predictors explained 18–27% of the variance in collaborative performance on each of the problem-solving measures (see Table 7). For all three problem-solving tasks, greater self-rated expectation of competitiveness was predictive of better collaborative performance. Greater partner-rated expectation of competitiveness was also a significant predictor of collaborative performance on the Everyday Problems Test and Everyday Problem-Solving Inventory. Self-rated expectation of collaborative satisfaction was a significant predictor of Everyday Problems Test and Errand-Planning task collaborative performance. For the Everyday Problems Test, working with a familiar partner was also related to higher performance; and for the Errand-Planning task partner-rated collaborative expectation was predictive of better performance.

Discussion

The current study examined the objective and subjective experience of older men and women who collaborated on three everyday problem-solving tasks. Male and female partners were differentially influential in determining collaborative outcome, and partners' subjective experience also differed. The actor's own appraisals as well as the partner's appraisals of the collaboration were predictive of performance.

Influence during the collaborative situation

Our findings suggest that partner gender influences collaborative outcome. For the performance of very structured tasks (i.e., generation of a correct answer to printed stimuli representing varied instrumental activities of daily living), males and females in the study equally influenced performance in the collaborative situation. However, during less-structured task situations (i.e., solving of interpersonal dilemmas and errand-planning/organisation tasks with no one prescribed solution), males had more impact on the collaborative outcome. For the errand-planning task, males were more likely to use their own judgement to influence their own collaborative outcome. While solving social problems, however, males were more likely to influence both their own collaborative performance and their female partner. This is in contrast to expectations and especially interesting in the light of performance differences between males and females on the Everyday Problem-Solving Inventory, which showed an advantage favouring females. Thus, it appears that males had more of an impact on collaborative outcome when the task was more ambiguous.

Given their higher Everyday Problem-Solving Inventory performance, coupled with the interpersonal nature of the task (traditionally a more stereotypically feminine domain), it is surprising that women did not prove to be the more influential partner during collaboration on this task. There was not a significant difference in errand-planning performance between males and females; however, males influenced collaborative outcome more than females on this task. It was expected that men would be more likely to influence collaborative performance on this task as men typically perform better on tasks involving spatial orientation (Halpern, 1997). The finding that men were more influential on the social dilemma task and the errand-planning task is somewhat unexpected as men on average did not demonstrate superior performance on these tasks.

Collaborative interaction between male and female partners may also be affected by *perceived* differences in task performance. Research has demonstrated a difference (often unwarranted) in the self-efficacy of males and females, as well as the perception of competence in males and females throughout childhood and adolescence despite actual performance (e.g., Cole, Maxwell, & Martin, 1997; Jacobs, 1991; Jacobs & Eccles, 1992; Zimmerman & Martinez-Pons, 1990), and these beliefs can be heightened in social situations involving both males and females. To address the possibility that influence was related to task familiarity and preference, post-hoc *t*-tests examining self-reported frequency and importance of completion of the three types of everyday tasks were examined. Men and women did not significantly differ ($p > .05$) on these ratings. Together these findings have consequences for collaborative outcomes, which appear to be driven more by interpersonal, social factors rather than by individual cognitive strengths or task familiarity.

Subjective appraisals

Familiarity appeared to play a definitive role in expectations of collaboration regarding satisfaction with collaborative team-work; men and women working with their spouse tended to rate their expectations of satisfaction with collaborative team-work more positively than their counterparts assigned to work with an unfamiliar partner. Women working with an unfamiliar male partner generally viewed their satisfaction with collaborative teamwork less positively compared to every other group. There was some indication that women who had worked with an unfamiliar male partner tended to rate their expectation of competitiveness more highly than men assigned to work with their spouse, and women working with an unfamiliar male evaluated their collaboration as more competitive compared to men who had worked with an unfamiliar female partner.

Most striking are the findings regarding the subjective expectations and evaluations of women who had worked with an unfamiliar male partner. These women largely rated their satisfaction with collaborative teamwork less positively and the interaction was viewed as more competitive. Given demographic trends showing that women have a longer life expectancy and are more likely to be widowed (Kinsella & Gist, 1998; US Census Bureau, 1996), it might be reasoned that the task of meeting and engaging with unfamiliar social partners after the death of a spouse disproportionately falls to older women. Older women are likely to experience a greater frequency of interactions with unfamiliar persons (especially those of the other gender) in a variety of realms including health care provision, home repair, and finances. Findings from the current study suggesting that women experience greater discomfort when working with unfamiliar men have implications for older women's everyday functioning. Older women may avoid, limit, or reap minimal benefits from the real-world task of meeting and working with new social partners in later life and after widowhood.

Subjective appraisals and objective collaborative performance

Self and partner-rated expectations of competitiveness were generally predictive of collaborative performance on all three problem-solving tasks. This suggests that for both male and female partners, overall expectation of competitiveness during cognitive collaboration may be related to motivation and/or preparation for more successful collaborative interaction. Perhaps some level of competition was already present for familiar, married partners who may routinely work on everyday cognitive tasks together and are likely to be aware of their partner's skill level. For persons working with an unfamiliar partner about whom no information regarding skill level is known coupled with a desire to appear competent, expectations of competition may have prompted increased motivation to perform at peak levels.

Future directions

The current study is limited in its ability solely to examine other-gender dyads, and partner familiarity is limited to other-gender partners, thus the effect of same-gender pairings cannot be investigated. Prior work (Carli, 1989; Maccoby, 1990) suggests that women in this study may have used less effective strategies during the collaborative interaction because they were interacting with men, resulting in less influence on the collaborative product. Qualitative coding of the collaborative process is warranted to investigate this possibility and specifically to identify both the verbal and nonverbal elements of effective and ineffective collaboration. It is likely that the collaborative process and outcome of older adults' interactions in same-gender pairings may differ from the results of the current study. Women and men in same-gender pairings may be more likely to exhibit equitable influence over the collaboration. Conversely, individual characteristics (particularly skill level) may be more predictive of influence on collaborative cognition processes and products in same-gender dyads than interpersonal factors. In order to address additional questions raised by the current study, future work should focus on the influence of individual ability level on collaborative outcome, particularly in relation to gender, as well as other predictors of cognitive collaboration (e.g. personality, marital satisfaction, control and gender beliefs) that might explain more variation in collaborative outcome.

The present findings are constrained by the imposed nature of problem solution. The outcome may have differed if participants had recorded their own answers prior to collaboration, or been compelled to come to consensus and submit one dyadic product. Additionally, the current findings suggest that perceived levels of competition were related to collaborative outcome. Future investigations utilising comprehensive assessments of competition are needed. Finally, it may prove fruitful to pursue this line of research in

cultures possessing more rigid gender roles surrounding mixed-gender interaction and cognitive task division. It is likely that the imbalance in collaborative influence on ambiguous tasks would be greater in cultures holding strong gender divisions, and where educational, economic, and career opportunities are greatly disparate between men and women.

Conclusions

In the current study, men tended to be more influential during collaboration on more ambiguous tasks and considerable differences were observed in the subjective expectations and evaluations of collaboration—with women paired with unfamiliar male partners viewing collaboration in the least positive light. Results also indicate that self and partner subjective appraisals were predictive of collaborative outcome. Taken together, these results suggest that interpersonal factors may be driving the objective and subjective experience of collaboration in mixed-gender pairs more than factors related to the cognitive task at hand or individual cognitive strengths.

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References

- Andersson J, Rönnerberg J. Recall suffers from collaboration: Joint recall effects of friendship and task complexity. *Applied Cognitive Psychology* 1995;9(3):199–211.
- Andersson J, Rönnerberg J. Collaboration and memory: Effects of dyadic retrieval on different memory tasks. *Applied Cognitive Psychology* 1996;10(2):171–181.
- Antonucci, TC. A life-span view of women's social relations. In: Turner, BF.; Troll, LW., editors. *Women growing older: Psychological Perspectives*. Thousand Oaks, CA: Sage; 1994. p. 239-269.
- Archer J. Comparing women and men: What is being compared and why? *American Psychologist* 1996;51(2):153–154.
- Bäckman L, Dixon RA. Psychological compensation: A theoretical framework. *Psychological Bulletin* 1992;112:259–283. [PubMed: 1454895]
- Barbieri MS, Light PH. Interaction, gender, and performance on a computer-based problem-solving task. *Learning and Instruction* 1992;2:199–213.
- Benenson JF, Apostoleris NH, Parnass J. Age and sex differences in dyadic and group interaction. *Developmental Psychology* 1997;33(3):538–543. [PubMed: 9149932]
- Berg, CA.; Meegan, SP.; Johnson, MMS. Collaborative interaction styles in young and old married couples. Paper presented at the annual meeting of the Gerontological Society of America; Los Angeles, CA. Nov. 1995

- Brown LN, Lahar CJ, Mosley JL. Age and gender-related differences in strategy use for route information: A "map-present" direction-giving paradigm. *Environment and Behavior* 1998;30(2):123–143.
- Byrne, BM. Structural equation modeling with LISREL, PRELIS, and SIMPLIS: Basic concepts, applications, and programming. Mahwah, NJ: Lawrence Erlbaum Associates; 1998.
- Carli LL. Gender differences in interaction style and influence. *Journal of Personality and Social Psychology* 1989;56(4):565–576.
- Cartensen LL, Levenson RW, Gottman JM. Emotional behavior in long-term marriage. *Psychology and Aging* 1995;10(1):140–149. [PubMed: 7779311]
- Cole DA, Maxwell SE, Martin JM. Reflected self-appraisals: Strength and structure of the relation of teacher, peer, and parent ratings to children's self-perceived competencies. *Journal of Educational Psychology* 1997;89(1):55–70.
- Cornelius SW, Caspi A. Everyday problem solving in adulthood and old age. *Psychology and Aging* 1987;2(2):144–153. [PubMed: 3268204]
- Corston R, Colman AM. Gender and social facilitation effects on computer competence and attitudes toward computers. *Journal of Educational Computing Research* 1996;14(2):171–183.
- Crook TH, West RL. Name recall performance across the adult life span. *British Journal of Psychology* 1990;81:335–349. [PubMed: 2224395]
- Cross SE, Madson L. Models of the self: Self-construals and gender. *Psychological Bulletin* 1997;122(1):5–37. [PubMed: 9204777]
- Denney NW, Pearce KA. A developmental study of practical problem solving in adults. *Psychology and Aging* 1989;4(4):438–442. [PubMed: 2619950]
- Dixon, RA.; Gould, ON. Adults telling and retelling stories collaboratively. In: Baltes, PB.; Staudinger, UM., editors. *Interactive minds: Life-span perspective on the social foundation of cognition*. New York: University Press; 1996.
- Dovidio JF, Brown CE, Heltman K, Ellyson SL, Keating CF. Power displays between women and men in discussions of gender-linked tasks: A multichannel study. *Journal of Personality and Social Psychology* 1988;55(4):580–587.
- Eagly A. The science and politics of comparing women and men. *American Psychologist* 1995;50(3):145–158.
- Feingold A. Cognitive gender differences are disappearing. *American Psychologist* 1988;43(2):95–103.
- Galea LAM, Kimura D. Sex differences in route-learning. *Personality and Individual Differences* 1993;14(1):53–65.
- Gonzalez, R.; Griffin, D. On the statistics of interdependence: Treating dyadic data with respect. In: Duck, S., editor. *Handbook of personal relationships*. New York: Wiley; 1997. p. 271–302.
- Gould ON, Dixon RA. How we spent our vacation: Collaborative storytelling by young and old adults. *Psychology and Aging* 1993;8(1):10–17. [PubMed: 8461106]
- Gould O, Kurzman D, Dixon RA. Communication during prose recall conversations by young and old dyads. *Discourse Processes* 1994;17:149–165.
- Gruber-Baldini AL, Schaie KW, Willis SL. Similarity in married couples: A longitudinal study of mental abilities and rigidity-flexibility. *Journal of Personality and Social Psychology* 1995;69(1):191–302. [PubMed: 7643300]
- Halpern DF. The disappearance of cognitive gender differences: What you see depends on where you look. *American Psychologist* 1989;44(8):1156–1158.
- Halpern DF. Sex differences in intelligence: Implications for education. *American Psychologist* 1997;52(10):1091–1102. [PubMed: 9329293]
- Hollingshead AB. Commentary on "The indiscriminate state of social class measurement". *Social Forces* 1971;49(4):563–567.
- Hollingshead, AB. *Four Factor Index of Social Status*. Yale University; New Haven, CT: 1975. Unpublished manuscript
- Hyde JS, Linn MC. Gender differences in verbal ability: A meta-analysis. *Psychological Bulletin* 1988;104(1):53–69.

- Jacobs JE. Influence of gender stereotypes on parent and child mathematics attitudes. *Journal of Educational Psychology* 1991;83(4):518–527.
- Jacobs JE, Eccles JS. The impact of mothers' gender-role stereotypic beliefs on mothers' and children's ability perceptions. *Journal of Personality and Social Psychology* 1992;63(6):932–944. [PubMed: 1460561]
- Jobe JB, Smith DM, Ball K, Tennstedt SL, Marsiske M, Rebok GW, Morris JN, Willis SL, Helmers K, Leveck MD, Kleinman K. ACTIVE: A cognitive intervention trial to promote independence in older adults. Controlled clinical trials. (in press).
- Katz S, Ford A, Moskowitz R, Jackson B, Jaffee M. Studies of illness in the aged: The index of ADL, a standardized measure of biological and psychological function. *Journal of the American Medical Association* 1963;185:94–99.
- Kaufman AS, Kaufman-Packer JL, McLean JE, Reynolds CR. Is the pattern of intellectual growth and decline across the adult life span different for men and women? *Journal of Clinical Psychology* 1991;47(6):801–812. [PubMed: 1757584]
- Kenny DA. Models of non-independence in dyadic research. *Journal of Social and Personal Relationships* 1996;13(2):279–294.
- Kinsella, K.; Gist, YJ. Gender and aging: Mortality and health. *International Brief*. 1998. [On-Line], *IB/98-2*. Available: <http://www.census.gov/ipc/www/wp98>
- Kirchler E. Spouses' joint purchase decisions: Determinants of influence tactics for muddling through the process. *Journal of Economic Psychology* 1993;14:405–438.
- Kolb JA. Are we still stereotyping leadership? A look at gender and other predictors of leader emergence. *Small Group Research* 1997;28(3):370–393.
- Kraemer HC, Jacklin CN. Statistical analysis of dyadic social behavior. *Psychological Bulletin* 1979;86:217–224.
- Lawton MP, Brody E. Assessment of older people: Self-maintaining and instrumental activities of daily living. *The Gerontologist* 1969;9:179–186. [PubMed: 5349366]
- Lee VE, Marks HM. Sustained effects of the single-sex secondary school experience on attitudes, behaviors, and values in college. *Journal of Educational Psychology* 1990;82(3):578–592.
- Light P, Littleton K, Bale S, Joiner R, Messer D. Gender and social comparison effects in computer-based problem solving. *Learning and Instruction* 2000;10:483–496.
- Lott B. Politics or science? The question of gender sameness/difference. *American Psychologist* 1996;51(2):155–156.
- Maccoby EE. Gender and relationships: A developmental account. *American Psychologist* 1990;45(4):513–520. [PubMed: 2186679]
- Marsiske, M.; Lang, FR.; Baltes, PB.; Baltes, MM. Selective optimization with compensation: Life-span perspectives. In: Dixon, RA.; Bäckman, L., editors. *Compensating for psychological deficits and declines: managing losses and promoting gains*. New York: Lawrence Erlbaum Associates; 1995. p. 35–79.
- Marsiske M, Willis SL. Dimensionality of everyday problem solving in older adults. *Psychology and Aging* 1995;10:269–283. [PubMed: 7662186]
- Masters MS, Sanders B. Is the gender difference in mental rotation disappearing? *Behavior Genetics* 1993;23:337–341. [PubMed: 8240213]
- Morris, JN. Setting eligibility requirements for the ACTIVE study. In: Miles, TP., editor. *Education as a contextual issue in prevention of cognitive declines*; Symposium conducted at the 50th Annual Scientific Meeting of the Gerontological Society of America; Cincinnati, OH. 1997 Nov.
- Murray SL, Holmes JG, Griffin DW. The benefits of positive illusions: Idealization and the construction of satisfaction in close relationships. *Journal of Psychology and Social Psychology* 1996a;70(1):79–98.
- Murray SL, Holmes JG, Griffin DW. The self-fulfilling nature of positive illusions in romantic relationships: Love is not blind, but prescient. *Journal of Psychology and Social Psychology* 1996b;71(6):1155–1180.
- Orsini A, Chiacchio L, Cinqui M, Cocchiaro C, Schiappa O, Grossi D. Effects of age, education, and sex on two tests of immediate memory: A study of normal subjects from 20 to 99 years of age. *Perceptual and Motor Skills* 1986;63:727–732. [PubMed: 3808855]

- Rabbitt P, Donlan C, Watson P, McInnes L. Unique and interactive effects of depression, age, socioeconomic advantage, and gender on cognitive performance of normal healthy older people. *Psychology and Aging* 1995;10(3):307–313. [PubMed: 8527052]
- Radziszewska B, Rogoff B. Influence of adult and peer collaborators on children's planning skills. *Developmental Psychology* 1988;24(6):840–848.
- Radziszewska B, Rogoff B. Children's guided participation in planning imaginary errands with skilled adult or peer partners. *Developmental Psychology* 1991;27(3):381–389.
- Schaie KW. The course of adult intellectual development. *American Psychologist* 1994;49:304–313. [PubMed: 8203802]
- Shackelford S, Wood W, Worchel S. Behavioral styles and the influence of women in mixed-sex groups. *Social Psychology Quarterly* 1996;59(3):284–293.
- Staudinger UM, Baltes PB. Interactive minds: A facilitative setting for wisdom-related performance? *Journal of Personality and Social Psychology* 1996;71(4):746–762.
- Strough J, Berg CA, Sansone C. Goals for solving everyday problems across the life span: Age and gender differences in the salience of interpersonal concerns. *Developmental Psychology* 1996;32(6):1106–1115.
- Thibaut, JW.; Kelley, HH. *The social psychology of groups*. New York: Wiley; 1959.
- US Census Bureau. Global aging into the 21st century. International Program Center (IPC); 1996. [Online]. <http://www.census.gov/ipc/prod/96wchart.pdf>
- US Census Bureau—1990 Census Lookup (5TF3C—part 1). 1999. (Searchable CD-ROM) <http://venus.census.gov/cdrom/lookup>
- Vancouver JB, Ilgen DR. Effects of interpersonal orientation and the sex-type of the task on choosing to work alone or in groups. *Journal of Applied Psychology* 1989;74(6):927–934.
- Voyer D, Voyer S, Bryden MP. Magnitude of sex differences in spatial abilities: A meta-analysis and consideration of critical variables. *Psychology Bulletin* 1995;117(2):250–270.
- West RL, Crook TH, Barron KL. Everyday memory performance across the life span: Effects of age and noncognitive individual variables. *Psychology and Aging* 1992;7(1):72–82. [PubMed: 1558708]
- Wilkie FL, Eisdorfer C. Sex, verbal ability, and pacing: Differences in serial learning. *Journal of Gerontology* 1977;32(1):62–67.
- Willis, SL.; Marsiske, M. *Manual for the Everyday Problems Test*. Pennsylvania State University, PA: Department of Human Development and Family Studies; 1993.
- Willis SL, Schaie KW. Gender difference in spatial ability in old age: Longitudinal and intervention findings. *Sex Roles* 1988;18(3/4):189–203.
- Wood W. Meta-analytic review of sex differences in group performance. *Psychological Bulletin* 1987;102(1):53–71. [PubMed: 3615706]
- Wood W, Karten SJ. Sex differences in interaction style as a product of perceived sex differences in competence. *Journal of Personality and Social Psychology* 1986;50(2):341–347. [PubMed: 3701581]
- Wood W, Polek D, Aiken C. Sex differences in group task performance. *Journal of Personality and Social Psychology* 1985;48(1):63–71.
- Zimmerman BJ, Martinez-Pons M. Student differences in self-regulated learning: Relating grade, sex, and giftedness to self-efficacy and strategy use. *Journal of Educational Psychology* 1990;82(1):51–55.

Figure 1.

Basic actor/partner model. Path *a* represents the “actor-influence”, which is constrained to equality for males and females in this model. Path *b* represents “partner-influence”, which is also constrained to equality for males and females in this example. Coefficient *c* represents the intraclass correlation of individual problem-solving performance for males and females, and coefficient *d* represents the residual intraclass correlation of collaborative problem-solving performance for males and females. Also shown in this figure are the critical design variables of the study, Familiarity and Order. Path *e*, designates the influence of partner Familiarity (i.e., unfamiliar partner versus married spouse), and path *f* designates the influence of problem-solving Order (i.e., Work Alone performance first versus Collaborative performance first) on collaborative performance.

Figure 2.

Final actor/partner model for the Everyday Problems Test examining gender and influence. $^t p < .10$; $* p < .05$.

Figure 3. Final actor/partner model for the Everyday Problem-Solving Inventory examining gender and influence. ^{ns} = non-significant; $p < .10$; $*p < .05$.

Figure 4.

Final actor/partner model for the Errand Planning task examining gender and influence. ^{ns} = non-significant; [†] $p < .10$; $^*p < .05$.

Table 1

Nested comparison of actor/partner model fit for the Everyday Problems Test examining gender and influence (N = 98)

Model step	Comparison to Initial Model									
	χ^2	df	GFI	p(RMSEA)	RMR	CFI	NFI	NNFI	IFI	p
MOD EPT1: Initial Model; Actor and partner paths were constrained to equality for males and females	11.77	11	.96	.58	.09	1.00	.94	.99	1.00	
MOD EPT2: Only partner influences were constrained to equality	10.65	10	.96	.58	.08	1.00	.95	.99	1.00	1 n.s.
MOD EPT3: Only actor influences were constrained to equality	10.87	10	.96	.56	.09	1.00	.94	.99	1.00	1 n.s.
MOD EPT4: Both actor and partner influences were allowed to vary	10.63	9	.96	.48	.08	0.99	.95	.99	0.99	2 n.s.

Note: n.s. = nonsignificant.

Table 2

Nested comparison of the actor/partner model fit for the Everyday Problem-Solving Inventory examining gender and influence (N = 98)

Model step	Comparison to Initial Model									
	χ^2	df	GFI	p(RMSEA)	RMR	CFI	NFI	NNFI	IFI	p
MOD EPSI1: Initial Model; Actor and partner paths were constrained to equality for males and females	16.76	11	.95	.26	.11	.98	.94	.97	.98	
MOD EPSI2: Only partner influences were constrained to equality	15.76	10	.95	.24	.11	.98	.94	.97	.98	1 n.s.
MOD EPSI3: Actor paths were constrained to equality for males and females	16.66	10	.95	.20	.11	.97	.94	.96	.97	1 n.s.
MOD EPSI4: Both actor and partner influences were allowed to vary	10.11	9	.97	.52	.09	1.00	.96	.99	1.00	2 .05

Note: n.s. = nonsignificant.

Table 3

Nested comparison of actor/partner model fit for Errand Planning examining gender and influence (N = 98)

Model step	<u>Comparison to Initial Model</u>									
	χ^2	df	GFI	p(RMSEA)	RMR	CFI	NFI	NNFI	IFI	p
MOD ERR1: Initial Model; Actor and partner paths were constrained to equality for males and females	24.06	11	.92	.05	.12	0.89	.82	.85	0.90	
MOD ERR2: Only partner influences were constrained to equality	16.93	10	.95	.19	.11	0.94	.88	.91	0.95	.01
MOD ERR3: Actor paths were constrained to equality for males and females	22.08	10	.93	.06	.12	0.90	.84	.85	0.90	n.s.
MOD ERR4: Both actor and partner influences were allowed to vary	16.21	9	.95	.16	.11	0.94	.88	.90	0.94	.01

Note: n.s. = nonsignificant.

Table 4

Covariate adjusted means for male and female problem-solving performance, controlling for partner familiarity and order effects (N = 196)

Problem-Solving Measure	Males (<i>n</i> = 98)		Females (<i>n</i> = 98)		<i>p</i> value
	Mean	(SD)	Mean	(SD)	
Everyday Problems Test					
Work Alone	49.52	(9.85)	51.07	(8.67)	.09
Collaboration	50.81	(8.47)	52.22	(7.29)	.12
Everyday Problem Solving Inventory					
Work Alone	48.12	(9.85)	51.55	(8.57)	.00
Collaboration	51.10	(10.54)	52.94	(9.55)	.02
Errand Planning Task					
Work Alone	50.53	(8.57)	51.44	(8.77)	.25
Collaboration	51.44	(9.16)	51.70	(8.37)	.77

Bonferroni corrected alpha, $p < .008$.

Table 5

Covariate adjusted means for male and female subjective appraisals controlling for partner familiarity and order effects (N = 178)

Subjective Appraisal Subscale	Unfamiliar Condition		Familiar Condition	
	Men (N = 39)		Women (N = 50)	
	Mean	(SD)	Mean	(SD)
Expectation of Satisfaction with Collaborative Teamwork	3.79 _{a,b}	(0.70)	3.81 _{c,d}	(0.65)
Evaluation of Satisfaction with Collaborative Teamwork	4.28 _e	(0.65)	4.03 _{e,f,g}	(0.81)
Expectation of Competitiveness	3.46	(1.05)	3.62 _h	(1.04)
Evaluation of Competitiveness	3.41 _i	(1.45)	3.97 _i	(1.06)

Means with the same subscript are significantly different: a,b,c,f,g = $p < .05$; d,e,h,i = $p < .10$.

Covariate adjusted male and female task-specific expectations of cognitive collaboration controlling for partner familiarity and order effects (N = 178)

Table 6

Task-specific expectations	Unfamiliar Condition			Familiar Condition		
	Men (N = 39)		Women (N = 39)		Men (N = 50)	
	Mean	(SD)	Mean	(SD)	Mean	(SD)
Everyday Problems Test						
Expected Percentage Correct	88.72	(15.92)	90.95	(15.10)	90.10	(12.31)
Collaborative Expectation	4.38	(0.71)	4.28	(0.83)	4.50	(0.79)
Everyday Problem-Solving Inventory						
Expected Percentage Correct	86.92	(13.55)	85.77	(17.00)	85.46	(16.01)
Collaborative Expectation	4.10	(0.85)	3.97	(0.87)	4.22	(0.91)
Errand Planning Task						
Expected Percentage Correct	87.95	(11.63)	91.38	(12.39)	89.20	(14.33)
Collaborative Expectation	4.13	(0.77)	3.95	(0.89)	4.18	(0.98)

Table 7

Summary of hierarchical regression analysis for self and partner subjective appraisals predicting collaborative problem-solving performance (N = 178)

	<i>B</i>	β	<i>SE B</i>	<i>R</i> ²
Everyday Problems Test				
Step 1: Design Variables				.05
Partner Familiarity	3.02*	.19	1.16	
Gender	1.48	.09	1.15	
Step 2: Subjective Appraisals—Self				.22**
Task-Specific Collaborative Expectation	0.11*	.19	0.04	
Task-Specific Percentage Expected to be Correct	−0.61	−.06	0.83	
Overall Expectation of Satisfaction with Teamwork	1.02	.09	0.98	
Overall Expectation of Competitiveness	2.28***	.34	0.47	
Step 3: Subjective Appraisals—Partner				.27*
Task-Specific Collaborative Expectation	0.05	.10	0.04	
Task-Specific Percentage Expected to be Correct	−0.75	−.07	0.84	
Overall Expectation of Satisfaction with Teamwork	1.69 [†]	.14	1.00	
Overall Expectation of Competitiveness	1.01*	.15	0.49	
Everyday Problem-Solving Inventory				
Step 1: Design Variables				.01
Partner Familiarity	0.78	.04	1.55	
Gender	1.92	.09	1.53	
Step 2: Subjective Appraisals—Self				.14**
Task-Specific Collaborative Expectation	0.10 [†]	.16	0.05	
Task-Specific Percentage Expected to be Correct	−0.07	−.01	1.05	
Overall Expectation of Satisfaction with Teamwork	0.50	.03	1.48	
Overall Expectation of Competitiveness	2.59***	.29	0.64	
Step 3: Subjective Appraisals—Partner				.18 [†]
Task-Specific Collaborative Expectation	0.05	.08	0.05	
Task-Specific Percentage Expected to be Correct	−0.52	−.04	1.05	
Overall Expectation of Satisfaction with Teamwork	0.43	.03	1.50	
Overall Expectation of Competitiveness	1.48*	.17	0.66	
Errand Planning Task				
Step 1: Design Variables				.00
Partner Familiarity	0.25	.02	1.26	
Gender	0.30	.02	1.25	
Step 2: Subjective Appraisals—Self				.14**
Task-Specific Collaborative Expectation	0.11**	.23	0.04	
Task-Specific Percentage Expected to be Correct	−0.06	−.01	0.80	
Overall Expectation of Satisfaction with Teamwork	1.27	.10	1.12	

	<i>B</i>	β	<i>SE B</i>	<i>R</i> ²
Overall Expectation of Competitiveness	1.60**	.22	0.51	
Step 3: Subjective Appraisals—Partner				.20*
Task-Specific Collaborative Expectation	0.10*	.21	0.04	
Task-Specific Percentage Expected to be Correct	−0.82	−.09	0.80	
Overall Expectation of Satisfaction with Teamwork	1.50	.12	1.12	
Overall Expectation of Competitiveness	0.93 ^t	.13	0.52	

Significance denotations after R^2 indicate a significant change from the previous step;

^t
 $p < .10$.

*
 $p < .05$.

**
 $p < .01$.

 $p < .001$.