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Friends (and Sometimes Enemies) With Cognitive Benefits: What Types of Social Interactions Boost Executive Functioning?

Oscar Ybarra[1], Piotr Winkielman[2,3], Irene Yeh[1], Eugene Burnstein[1,3], and Liam Kavanagh[2]

Abstract

Recent findings indicate interventions can boost executive functions—mental processes that have long been thought to be static and not open to change. The authors examined whether and how short-term social interactions could create such cognitive benefits. Study 1 found that basic get-to-know-you interactions (with or without an explicit cooperative goal) boosted executive function relative to controls and as much as nonsocial intellective activities. In contrast, interactions involving a competitive goal resulted in no boosts. Studies 2 and 3 tested a proposed mechanism for the results—that people need to engage with others and take their perspective to realize cognitive boosts. The findings show that competitive interactions, if structured to allow for interpersonal engagement, can boost executive functions. The results highlight how social functioning can enhance core mental capacities.

Keywords

executive function, socializing, cooperation, competition, mind reading

Life requires problem solving. Whether an employee is deciding about a job, a student planning his or her schedule, or a spouse coping with a relationship, life regularly provides us with problems to solve. Here we address one key ingredient in people's problem-solving capacity—executive functions (EFs). EFs are generally classified into three processes—working memory and updating, cognitive control and shifting, and inhibition (e.g., Miyake et al., 2000). However, no measure of EF is free of the other processes. Furthermore, EFs interact to enable manipulation and active maintenance of plans and goals while monitoring performance and inhibiting environmental or internal distractions (Kane & Engle, 2002). In short, EFs help people navigate life by facilitating flexible plan formulation and goal pursuit in a distraction-rich world (cf. Posner & Rothbart, 2007).

Except for changes across the life span, EFs have long been viewed as relatively static (Jaeggi, Buschkuehl, Jonides, & Perrig, 2008). Recent research, though, is beginning to show that EFs can be positively influenced by extended interventions (e.g., Jaeggi et al., 2008; Rueda, Rothbart, McCandliss, & Saccomanno, 2005). In addition, other research has unearthed diverse shorter-term intervention effects on cognitive functioning, such as the restorative effects of meditation training and walking in natural versus urban landscapes (Berman, Jonides, & Kaplan, 2008; Tang & Posner, 2009).

Here we focus on another factor recently found to positively influence executive functioning—social interaction, even if it lasts only a few minutes. Recent research has shown that social interaction involving discussion of a common topic produced short-term benefits comparable to brain-training games (Ybarra et al., 2008). These findings raise two related questions. First, what kind of social interactions benefit cognition? We propose that short social interactions are beneficial for executive functioning to the extent they require mental engagement with the other parties during interaction. Second, how does a social interaction—a recurring feature of most people's lives—affect fairly basic, downstream cognitive outcomes? We propose a solution by highlighting links between social inferences and EFs.

Current Research

To answer the above questions we conducted three studies that examined transfer from social interaction to tests of executive functioning. These studies focused on the linchpins of much social cognition—cooperative and competitive social

[1] University of Michigan, Ann Arbor, MI, USA
[2] University of California, San Diego, La Jolla, CA, USA
[3] Warsaw School of Social Sciences and Humanities, Warsaw, Poland

Corresponding Author:
Oscar Ybarra, University of Michigan, 3006 East Hall, 530 Church Street, Ann Arbor, MI 48109
Email: oybarra@umich.edu

interactions. These two interaction types represent fundamental ways of how people make sense of others and are found across cultures (Brown, 1991). This makes sense given the mixed-motive nature of group life (Humphrey, 1976).

Importantly, in terms of potential to influence subsequent cognitive functioning, cooperative and competitive interactions involve social-cognitive processes related to EFs (Decety, Jackson, Somerville, Chaminade, & Meltzoff, 2004). It has been proposed, for example, that EFs have been pressured by the need to flexibly respond to cooperative and competitive scenarios in daily life (cf. Humphrey, 1976; Moll & Tomasello, 2007). After all, to cooperate people must engage in mind reading, perspective taking, as well as inhibition in observance of norms and others' needs (Adolphs, 2003; Bjorklund & Kipp, 2002). To achieve advantage in competition people sometimes need to determine others' intentions and hide their own. For example, seeing others in a distrustful way—as potential "cheaters"—results in more systematic cognitive processing (Schul, Mayo, & Burnstein, 2004).

One key issue, though, is whether during interaction people will mentally engage with others and attempt to build a model of their minds (e.g., intentions, desires). Both cooperative and competitive goals can invoke mentalizing, but often the default under competition is to become self-protective and withdraw from engaging the other person. This is likely when the competitive interaction is ambiguous and not well structured (i.e., not an explicit game with rules), which inclines people to avoid being characterized as a way of deterring interpersonal costs (Miller, 1997; Ybarra et al., 2010). As a result, people turn inward rather than engaging in mind reading and perspective taking.

Thus, a key aspect of whether social interaction creates subsequent EF boosts rests on people taking perspective and engaging each other. When people do this, they have to maintain the goal of carrying out the interaction, represent where the interaction is and where it is heading, and guide the interaction while inhibiting certain tendencies (e.g., dominating interaction) and limiting distractions (e.g., attending to the chime of a text message). This process of engaging with others and taking perspective is structurally analogous to executive functioning, which involves maintaining plans and goals in an active state while monitoring performance and inhibiting distracting stimuli, whether from the environment or internally (Kane & Engle, 2002). Furthermore, a variety of research indicates that social inferential processes involved in social interaction such as theory of mind overlap with executive functioning (Apperly, Samson, & Humphreys, 2005; Carlson, Moses, & Breton, 2002). Finally, there is overlap in the neural circuits associated with social cognition and executive functioning (Adolphs, 2003).

The predicted outcome of people taking perspective and engaging each other are cognitive boosts following social interaction, which result from the preactivation of general mental operations involved in both social interaction and executive functioning tasks (Ybarra et al., 2008). This is similar to the process underlying transfer benefits across tasks that share little content but rely on similar general cognitive processing (Singley & Anderson, 1989). An alternative, though, might be that because some social interactions result in mental exercising, instead of boosts, subsequent performance reductions should occur (Finkel et al., 2006; Richeson & Trawalter, 2005). We note, though, that depletion effects usually involve very strenuous, challenging interactions. Furthermore, they are not universally observed and can depend on people's beliefs rather than resource depletion per se (e.g., Job, Dweck, & Walton, 2010). Nevertheless, the present studies allowed us to test these different perspectives.

We tested our theoretical reasoning in three studies. In Study 1 we compared control and nonsocial intellective activities conditions (brain games) to three interaction conditions. These three conditions involved participants "getting to know each other," but one also had a cooperative goal inviting participants to mentally engage with others and another had a competitive goal that discouraged participants from mentally engaging with others. In Studies 2 and 3 we investigated the purported mechanism and tested the hypothesis that even competitive interactions, if they induce mind reading and perspective taking, can boost EFs.

Study 1

This experiment compared the efficacy of different social interactions in boosting executive functioning. Three conditions involved a "getting-to-know-you" interaction, but two of these involved either a cooperation or competition goal. The basic getting-to-know-you interaction without an explicit goal is tacitly cooperative, as it requires participants to mutually build models of each other's minds (cf. Mitchell, Macrae, & Banaji, 2004). We predicted that the basic getting-to-know-you and cooperative goal interactions would provide cognitive boosts compared to a competitive goal interaction and no-intervention control. Finally, based on previous research (Ybarra et al., 2008), we expected "get-to-know" and cooperative goal conditions to yield comparable boosts to nonsocial brain games.

To test these hypotheses we compared performance on different cognitive tests. We measured EFs (Trail test) and expected performance differences as discussed above. To ensure transfer was specific to EFs, we also measured generic processing speed, which is unrelated to cognitive flexibility and the ability to perceive relations (Conway, Cowan, Bunting, Therriault, & Minkoff, 2002). For example, responses based on habits or template matching can be quickly carried out even under cognitive load (Smith & DeCoster, 2000). Thus, we expected performance on generic speed to not vary across conditions. This would also help verify participants were motivated to perform the cognitive battery.

Method—Participants and Procedure

A total of 79 participants (48 females; age range = 17-34) received course credit to participate. They were randomly assigned to one of five conditions (get to know, competition, cooperation, control, and brain games). Controls received no intervention—after an introduction they were presented with the cognitive battery. Previous research used a 10-min filler activity control—a movie (Ybarra et al., 2008). We chose this control because it provides a baseline that is minimally contaminated, motivationally or cognitively.

Social interaction groups engaged in a 10-min interaction with a confederate blind to condition. We first gave competition and cooperation participants information about a future interaction—a description of the prisoner's dilemma game, adapted from Kay, Wheeler, Bargh, and Ross (2004). For competition participants the game was called the Wall Street Game and the other participant an "opponent." For cooperation participants the game was called the Community Game and the other participant a "partner." We chose this manipulation because previous research showed that a fairly subtle context manipulation influences whether participants activate other- versus self-oriented behavioral intention in the game (Kay et al., 2004).

Following this, competition and cooperation participants were told they would first get to know the other person. Those in the basic "get-to-know" condition received no information about a future interaction. At this point participants were told to take 2 min to write down questions to ask the other person to get to know her or him (confederate's questions provided by experimenters). Then participants were introduced to the confederates, who were instructed to stick to a neutral but not unfriendly approach. After 8 min the experimenter stopped the interaction and presented the cognitive battery. Competition and cooperation participants were told that because of time constraints we would be skipping the future interaction.

Brain games participants also carried out a 10-min task composed of three intellectual activities (reading comprehension for 3 min, crossword puzzle for 4 min, spatial rotation task for 3 min). We chose these tasks because they have external validity and represent readily available activities people engage in to try to stay mentally sharp. Also, similar activities have been shown to predict cognitive functioning (Verghese et al., 2003).

After their assigned task, participants completed the cognitive battery, which consisted of a task tapping (a) simple processing speed and (b) EFs. The speed task involved a template matching procedure in which participants made same–different judgments about two dot patterns presented side by side on paper sheets—there were multiple pairs per sheet. Participants were given 45s per each of three sets to attempt as many of the comparisons in the allotted time (Park et al., 2002). The speed score was the average number of correct comparisons across the sets.

EFs were measured with the Trail Making Test (Reitan & Wolfson, 2001), which we chose for several reasons. First, it is widely used and brief. Second, the test captures the EF components of shifting, attention, and working memory (Baddeley, 1996; Crowe, 1998). Furthermore, performance on the test is associated with similar neural activations as other EF tasks including the Stroop, Wisconsin Card Sort, and Go–No Go tasks (Moll, Oliveira-Souza, Moll, Bramati, & Andreiuolo, 2002). Finally, it has a built-in control for raw processing speed and general motivation. In short, the test provides a good assessment of cognitive flexibility.

The test has two timed parts. On Trails–A participants connect in order encircled numbers, 1 through 25, that are randomly distributed on a sheet of paper. On Trails–B there are also 25 circles, but some of the circles have letters (A-M) and others numbers (1-12). Participants connect the circles and preserve order while switching between alpha and numeric modes (e.g., link A to 1, then 1 to B, etc.). In our administration we did not have participants correct errors on-line. Instead, after the test was completed, research assistants blind to condition made penalty adjustments for any errors. Trails–A is a simple speed task (Bowie & Harvey, 2006), so we predicted no differences here. Trails–B assesses both speed and switching. Thus, the Trails–B minus Trails–A difference is used as a measure of the working memory and switching cost between tasks—both components of EFs. Lower scores signify less interference or greater flexibility, while controlling for general speed and motivation.

After the cognitive battery, participants, using 6-point Likert-type scales, evaluated their activity (save for controls; e.g., engaging, stimulating). Social interaction participants also rated themselves on various positive and negative emotions, and they also rendered impressions of the interaction partner (5-point scales).

Results and Discussion

One participant (competition) did not complete the dot speed measure. As expected, there were no differences across conditions on this speed task, $F(4, 73) = 1.72$, $p = .15$ (see Figure 1 and Table 1). Controlling for number of attempts did not alter the results. Also as expected, performance on Trails–A, which also assesses speed, showed no differences across condition, $F(4, 74) = 0.46$. Equivalent speed performance across conditions also suggests that all participants were equally motivated to perform the cognitive battery.

The EF task results showed the predicted differences across conditions, $F(4, 74) = 3.19$, $p < .02$. Of greater interest, the control group was outperformed by the get-to-know group, $t(74) = 2.73$, $p < .008$, $d = .85$, and the cooperation group, $t(74) = 2.18$, $p < .032$, $d = .73$. Furthermore, the competition group showed lower cognitive performance than the get-to-know, $t(74) = -2.80$, $p < .007$, $d = .79$, and cooperation groups, $t(74) = -2.21$, $p < .03$, $d = .91$. There was no difference between the get-to-know and cooperation groups, $t(74) < 1.00$, or between the competition and control groups, $t(74) < 1.00$. Finally, performance by the brain games group was in the middle of the five groups, so that it did not differ from the combined control and competition conditions, $t(74) = 1.49$, $p < .14$, $d = .43$, or the combined get-to-know and cooperation conditions, $t(74) = -1.46$, $p < .15$, $d = -.65$. These patterns were reflected in an interaction between condition and test type (speed, EF), $F(4, 73) = 3.51$, $p < .01$.

In sum, we found no differences on a generic speed task but selective boosts on a task tapping EFs. In the context of social interaction, this was the case only when the interactions were cooperative—but not competitive—in nature. Participants' evaluations of the activities indicated the brain games

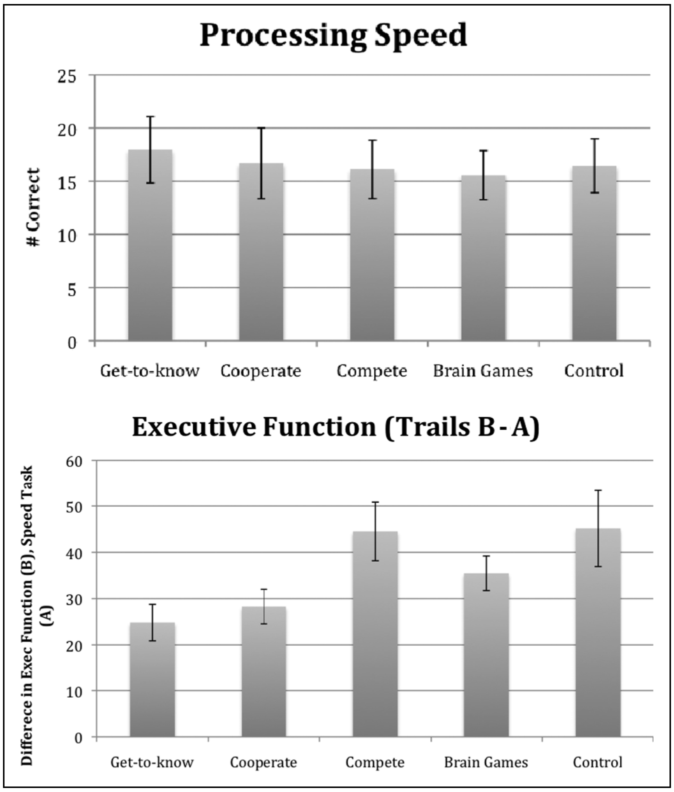

Figure 1. Cognitive performance as a function of condition
Error bars are ± standard errors.

condition was evaluated less positively than the social interaction conditions, $t(60) = -2.83$, $p < .006$. However, the three interaction conditions did not differ from each other, meaning the competition interaction was evaluated the same as the other two interactions, *t*s of 1.30 and < 1. Thus, activity evaluation did not covary with EF performance. The emotions measure and measure of partner impressions showed no differences across the interaction conditions.

Previous research showed that a discussion of a social topic benefited participants' EF (Ybarra et al., 2008). The present study shows that social interaction that captures normal social activities such as getting to know another person can result in subsequent cognitive benefits. The present study also shows that interactions that involve a cooperative goal also yield subsequent cognitive boosts, whereas an interaction that involves a competitive goal does not. These findings support our proposal that cooperative social interactions may "by default" exercise EFs, presumably because people engage one another, which triggers processes such as mind reading and perspective taking. On the other hand, competitive goals can limit the degree to which EFs are exercised, presumably because competition triggers withdrawal and self-protection, thus reducing the amount of mental engagement with the other person (Ybarra et al., 2010).

If our analysis is correct, it should be possible to structure the competitive interaction to trigger attempted mind reading and produce cognitive boosts, which is what we examined in the next study.

Table 1. Study 1 Performance as a Function of Condition and Type of Cognitive Functioning Test

Condition	Dot speed task		Executive function task (B – A)		
	M	*SD*	*M*	*SD*	*n*
Get to know	17.96	3.12	24.83	16.73	18
Cooperate	16.69	3.32	28.27	14.44	15
Compete	16.11	2.73	44.50	25.31	16
Brain games	15.57	2.31	35.47	13.91	17
Control	16.46	2.54	45.15	29.68	13

Dependent measure means and standard deviations. The speed score reflects the number of comparisons answered correctly (averaged across sets). The executive function score reflects Trails–A time subtracted from Trails–B time (adjusted for errors). For speed, larger scores indicate better performance, but for EF lower scores mean better performance.

Study 2

Study 2 tested this idea by creating a competitive social interaction that involved mind reading. Specifically, it involved a lie production–lie detection game. Children start acquiring ToM—theory of mind—from the age of 3 to 4 (Wellman, 1990)—around the age when they start to pretend and deceive. In fact, children's capacities for complex mind reading and lie production and detection go hand in hand (Talwar, Gordon, & Lee, 2007). Among adults, the ability to detect "cheaters" has been argued to play a critical role in social functioning (Cosmides & Tooby, 1992). At older ages, patients with degenerative brain disease show corresponding deficits in mind reading and in their capacity to recognize lies, leaving them vulnerable to misinformation and scams (Ybarra & Park, 2002). In short, competitive social interaction, if aimed at deciphering truth, which involves mind reading, relies heavily on EFs (Apperly et al., 2005; Carlson et al., 2002).

Reflecting these insights, we compared effects of competitive social interaction involving mind reading to a no-intervention control and also a brain games condition. We expected the competitive social interaction condition to produce boosts in executive functioning relative to controls. Based on Study 1, we did not expect differences between the social interaction and the brain games group. However, it is possible the augmented mind reading in the competitive interaction in Study 2 would result in even better EF performance.

In addition to examining performance on a generic speed task and an EF task, in this study we also included a general knowledge test to further examine the specificity of the cognitive boosts. General knowledge or crystallized intelligence varies less than fluid intelligence, for example, as a function of age (Hedden & Gabrieli, 2004), whereas context can influence EFs (Jaeggi et al., 2008). Thus, we expected performance not to vary across conditions for both the speed task and general knowledge test.

Method—Participants and Procedure

In all, 84 participants (41 females; age range = 18-22) received course credit and were randomly assigned to one of three conditions (competitive interaction, control, and brain games). As in Study 1, the control "no-intervention" group, following an introduction to the session, was provided the cognitive battery, whereas the two experimental groups first engaged in a 10-min intervention and then completed the cognitive battery. Social interaction participants were put in a competitive situation that induced attempts at mind reading of another participant (no confederates used). Participants were given 2 min before the interaction to prepare and write down 12 things about themselves, half true and half false. Then they took the remaining 8 min to interact, taking turns stating one item at random from their list, with the other participant assessing the statement's veracity. Thus, the task involved both lie production and lie detection. We were not interested in performance on this task; our pilot testing had shown performance to be at chance levels. We simply used the activity to trigger mind reading in a competitive setting. Brain games participants completed the same activities as in Study 1.

Participants were then administered the cognitive battery. We used the same dot speed task as Study 1. To generalize our findings to other EF tasks we used a reading span task, which requires maintaining in memory words that occur at the end of sentences (storage component) while simultaneously monitoring the sentences for meaning to answer questions about them (processing component; e.g., Daneman & Carpenter, 1980). Thus, this task involves working memory and executive attention, as people have to maintain a representation of the task while dealing with distracters. Participants had to recall the test items to at least two of the trials before proceeding to the next, more difficult block of trials. The score was the number of correctly answered trials across blocks.

We measured general knowledge with a 48-item multiple-choice test involving vocabulary, analogies, and math problems requiring rudimentary procedures (Janda, 1996). Participants had 6 min to complete as many of the items. After the cognitive battery, participants, save for controls, evaluated the activity (i.e., engaging, stimulating, and enjoyable).

Results and Discussion

Two mind-reading participants were excluded for failure to comply with reading span instructions. An additional participant (control) was excluded because his or her reading span score was 3 standard deviations above the condition mean. Including this score reduced the magnitude of the effects but not the overall nature of the differences.

The data, shown in Table 2 (see Figure 2), replicated those of Study 1 for the speed task; there were no differences across conditions, $F(2, 78) = 2.13$, $p = .125$. Controlling for number of attempts made no difference. However, on the reading span task there were condition differences, $F(2, 78) = 5.28$, $p < .007$. Follow-up analyses indicated the social interaction group outperformed the control group, $t(51) = 3.25$, $p < .01$, $d = .91$, and also the brain games group, $t(52) = 2.18$, $p < .05$, $d = .60$. Furthermore, there was no difference in reading span performance between the brain games and control groups ($p = .45$).

Table 2. Study 2 Performance as a Function of Condition and Type of Cognitive Functioning Test

Condition	Dot speed task		Executive function task (reading span)		General knowledge		
	M	*SD*	*M*	*SD*	*M*	*SD*	*n*
Mind reading	16.65	2.50	11.46	1.75	32.31	5.75	26
Brain games	16.14	2.96	10.46	1.62	31.46	4.71	28
Control	17.67	2.82	10.18	1.04	32.07	5.80	27

Dependent measure means and standard deviations. The speed score is the same as in Study 1. The EF score reflects number of trials correctly performed. General knowledge reflects number of questions answered correctly. In all cases larger scores indicate better performance.

The different patterns across cognitive tasks were reflected in an interaction between condition and type of task (speed, EF), $F(2, 78) = 3.39$, $p < .04$.

Finally, general knowledge did not differ across conditions (all effects < 1.00), indicating that the social interaction specifically targeted EFs. We also assessed how participants evaluated the activity (save for controls). Participants showed a trend toward evaluating the mind-reading condition more positively than the brain games condition ($p < .07$). However, controlling for evaluation did not alter the nature of the results.

This study showed that a competitive social interaction, if it involves mind reading, can also provide subsequent EF boosts. Also building on earlier research (Ybarra et al., 2008) and Study 1, the findings showed that a social interaction laden with attempted mind reading can at times outperform nonsocial intellective activities in terms of EF, although this conclusion should be treated cautiously given the uneven effects of the brain games condition. Importantly, the effects of social interaction were specific to core EFs and not processing speed or general knowledge.

Study 3

Studies 1 and 2 are consistent with our proposal that social interaction boosts executive functioning when people take perspective and engage with the other person—even if the interaction is competitive. However, differences across the two studies in the types of competitive interactions and the EF tests limit a firm conclusion. Thus, to evaluate whether perspective taking—rather than cooperative or competitive goals per se—stimulates executive functioning, we designed another experiment, similar in methodology to the competition condition of Experiment 1 but with some participants encouraged to engage in perspective taking.

Participants were all told they would play the Wall Street Game (e.g., investor) with an opponent. Participants in one condition were told that to do well in the game they should try their best to understand their opponent and take their opponent's perspective. Participants in the other condition were told that to do well they should not let their opponent try to understand them or take their perspective. Thus, although both

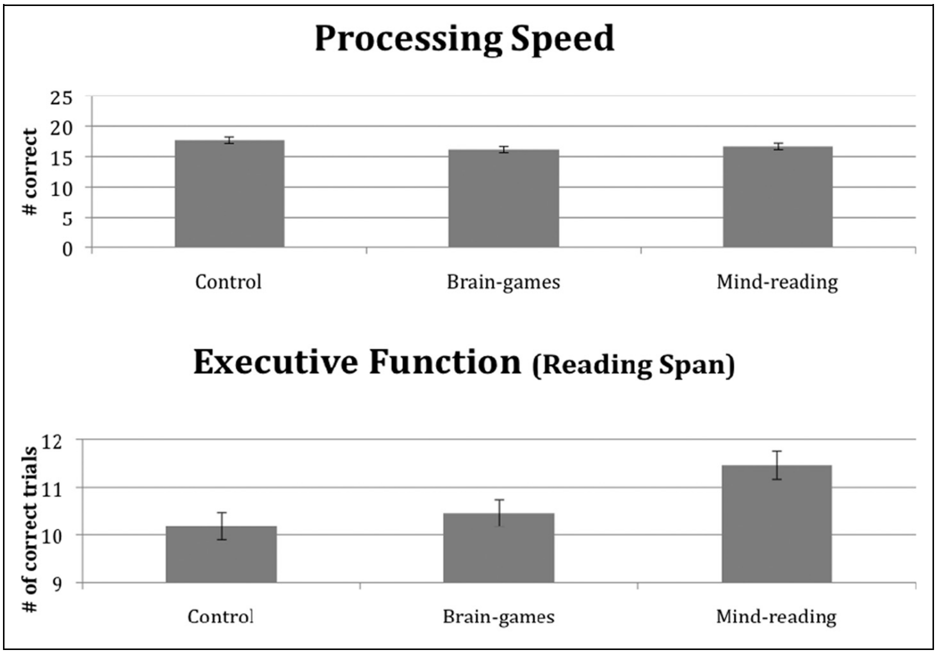

Figure 2. Cognitive performance as a function of condition
Error bars are ± standard errors.

conditions involved a social interaction with an opponent, in only one of the conditions were participants encouraged to take perspective and try to "read their opponent's mind." The other major difference from Experiment 1 was that the Trail Making Test was the only measure used, with Trails–A serving as the measure of simple processing speed. We expected that participants in the perspective-taking condition would outperform those in the perspective-taking-prevention condition on measures of EF but not processing speed.

Method—Participants and Procedure

In all, 29 participants (17 females; age range = 18–25) received course credit and were randomly assigned to either the perspective-taking or perspective-taking-prevention condition. Participants were put in a competitive situation that either induced attempts at taking the perspective of another person or induced them to keep the other person from taking their perspective. All participants were given 2 min before the interaction to write down questions to ask their opponent (confederate) during the interaction phase. The two "players" then took 8 min taking turns asking each other questions from their lists (confederates' questions were provided by the experimenters). The confederate was not informed of the presence of different instructions among participants and was instructed to take a neutral but not unfriendly approach. As before, participants did not actually play the subsequent Wall Street Game but were told that time constraints prevented this.

Participants then received the Trail Making Test used in Study 1. It was expected that Trails–A performance would not differ between groups but that Trails–B – Trails–A—which taps EFs—would show better performance for the perspective-taking than perspective-taking-prevention participants. After the Trails test, participants evaluated the interaction activity as in Study 1.

Results and Discussion

As expected, our planned contrast indicated that there was no difference between conditions on the speed measure, Trails–A time, $t(27) = 0.24$, $p = .81$, perspective taking $M = 34.36$, $SD = 7.75$ vs. perspective taking prevention $M = 33.62$, $SD = 8.62$. However, there were differences on the EF measure between the perspective-taking ($M = 28.74$, $SD = 17.05$) and the perspective-taking-prevention conditions ($M = 39.39$, $SD = 15.78$), Trails–B – Trails–A, $t(27) = 1.74$, $p < .05$, $d = -.65$. This indicates that the social interaction with perspective taking specifically targeted EFs and not processing speed. We also assessed how participants evaluated the activity; there were no differences in evaluation between the conditions (ts < 1).

This study further supports the idea that a competitive social interaction, if it involves mind reading and engaging with the other person, can also provide subsequent performance boosts on EF.

General Discussion

The present studies extend earlier findings of EF boosts following a simple discussion of a social topic (Ybarra et al., 2008). This extension comes in three ways. First, together with earlier research, the findings highlight the connection between social and general cognition. This fits with evolutionary perspectives highlighting social pressures on the emergence of intelligence (e.g., Humphrey, 1976), with discussions about how social forces shape the development of mentality (Baumeister & Masicampo, 2010; Posner & Rothbart, 2007), and with research on the neural overlap between social-cognitive function and EFs (Decety et al., 2004).

However, our findings also suggest important differences between kinds of social interactions, as not all of them result in cognitive boosts. Specifically, in Study 1, holding a competitive goal did not produce cognitive benefits. We have argued that competitive goals tend to induce withdrawal and desire to avoid characterization (Ybarra et al., 2010). However, if a competitive situation is constructed to facilitate mind reading and engagement with the other, as in Studies 2 and 3, then cognitive boosts can occur.

The present research also shows that not all types of cognitive functions are equally affected—social interaction did not affect tasks tapping speed or general knowledge. This makes sense given that speed is a generic ingredient in various cognitive processes (Conway et al., 2002; Horn & Cattell, 1966). Similarly, general knowledge shows fewer differences across individuals, for example, as they age (Hedden & Gabrieli, 2004), whereas EFs are influenced by context (Jaeggi et al., 2008).

Caveats and Implications

Future studies should explore the specific mechanisms underlying transfer from social interaction to EF tasks. One radical, but perhaps unlikely, possibility involves temporary changes in raw availability of executive resources. More likely possibilities involve a change in the pattern of use of executive resources. Thus, social interaction could temporarily increase cognitive accessibility of flexible processing styles or particular operations that subsequently overlap with EF tasks (e.g., switching routines, memory routines). There could also be transfer of willingness to deploy those resources. The current results found no evidence of general differences in motivation or mood, so the "cognitive" rather than "motivational" account seems more likely.

Some available research has shown that strenuous and extended social interactions can leave people cognitively depleted, as reflected for example by poorer performance on subsequent cognitive tasks (e.g., Finkel et al., 2006; Richeson & Trawalter, 2005). Although additional research is needed to determine the conditions that result in depletion and boosts, our perspective suggests that besides length and difficulty, another contributing factor may be the degree to which the interaction induces withdrawal from the other person—disengaging from mind reading—while increasing a focus on the self.

One point of strength but also a limitation of the current study is its focus on a college population. Future studies should examine these effects in older adults, who are more likely to undergo cognitive decline.

In closing, EFs are a basic component of mental fitness. It is fascinating that simply making friends (and sometimes dealing with enemies) can provide cognitive benefits.

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Bios

Oscar Ybarra is professor of psychology at the University of Michigan. His research examines how social factors (interpersonal, group, organizational) influence general cognition,

decision making, and behavioral flexibility and creativity. His work draws on the methods of social and cognitive psychology.

Piotr Winkielman is a professor of psychology at the University of California, San Diego. His work explores the interplay between emotion, cognition, and embodiment, and draws on methods of social and cognitive psychology as well as social neuroscience.

Irene Yeh is a PhD student in social psychology and social work at the University of Michigan. She is interested in emotion, intergroup relations, and intergroup dialogue.

Eugene Burnstein is professor emeritus at the University of Michigan and lecturer at the Warsaw School of Social Sciences and Humanities and the University of Warsaw. His research examines interpersonal phenomena such as altruism, cooperation and trust from an evolutionary perspective.

Liam Kavanagh is a graduate student at the University of California, San Diego. His work focuses on the cognitive stimulation derived from social interaction, emotional aspects of embodiment, mimicry and social inference, and processing fluency. Before returning to academia, he worked for three years each in New York and Tanzania as a researcher on a variety of national-level economic and social issues.