

E-Research Collaboration and the Free-Rider Problem: Communication Solutions to Social Dilemmas in Computer Mediated Research Collaborations

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Abstract Collaborative scientific projects can be considered public goods dilemmas. This is a particular type of social dilemma, where short-term immediate self-interests are at odds with long-term collective benefits. Perhaps the best known solution to the free-rider problem in social dilemmas is communication between participants prior to making contributions to the public good. However, there is research to suggest that people contribute less to public goods while communicating on-line before the dilemma, as opposed to face-to-face discussion. This chapter will discuss why computer-mediated mediums of communication are less effective at improving cooperation amongst collaborators (e.g., lack of social cues to examine the credibility of commitment, less leadership, and poorer monitoring of other's behavior) and propose several means for addressing this challenge to on-line collaborations (e.g., video-conference, telephone communication, prior face-to-face interactions, frequent coordinated communications, and reputation evaluations).

1 Introduction 19

Zarelda, a political scientist, is preparing a grant proposal on the topic of communication and conflict resolution. She understands that the best approach to studying this relationship is via multiple perspectives and methods across disciplines. She joins an online research community (e.g., MyNetResearch) with hopes of finding three potential collaborators. Zarelda finds three interested scholars and sends an email outlining the work for each individual, emphasizing the grant is due in 2 months. One week before the deadline, Zarelda notices that two of her collaborators

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27 are not fulfilling their promised contribution to the project. Instead, their work is
28 cursory and contains several errors. In the end, Zarelda feels frustrated, has a poor
29 grant prepared for her project, and later the grant is rejected.

30 The problems experienced by Zarelda may be common to internet collabora-
31 tions. Certainly, it is exciting that the internet is making possible communication
32 between scholars across nations and disciplines, without ever meeting collaborators
33 face-to-face. Such collaborations are a welcomed change, but there are some
34 challenges unique to these internet collaborations. Although Zarelda's problem
35 with others' lack of effort can occur in any collaborative research project, it may
36 be that the problem is more profound in the context of internet collaborations. In
37 particular, internet collaborations may often fall prey to the free-rider problem –
38 which occurs when individuals put less effort towards a research project, and free-
39 ride on the efforts of their collaborators.

40 All collaborative research projects can be considered a social dilemma. A social
41 dilemma occurs when immediate self-interest conflicts with long-term collective
42 interest (Kollock 1998). For example, in Zarelda's research project, it is in the
43 others' self-interest to allocate less time and effort reading, writing, and thinking
44 about the current project, and to spend their time and effort otherwise, all the while
45 free-riding on the efforts of their collaborators. However, if all group members
46 behave this way, then everyone fails to gain the collective benefit (e.g., a quality
47 grant proposal). Much research in the social sciences has attempted to understand
48 and resolve the free-rider problem. Examining this research, one factor emerges
49 supreme in resolving the problem: communication.

50 Much research supports the general conclusion that communication before the
51 dilemma enhances cooperation amongst group members in the dilemma (Dawes
52 et al. 1977; Kerr et al. 1997; Orbell et al. 1988; for review see, Balliet 2009).
53 However, there is also research that suggests face-to-face communication is more
54 effective than other forms of communication, e.g., written messages, email, or
55 chat groups (Balliet 2009; Bos et al. 2009; Frohlich and Oppenheimer 1998;
56 Rocco 1998). This poses a particular problem for internet collaborations. While
57 these collaborations may still pose a social dilemma, the means of communication
58 in these social interactions are less effective in resolving the free-rider problem. In
59 the following, I will briefly address the relevance of social dilemmas to internet
60 research collaboration, discuss theory and research on the effects of communica-
61 tion in social dilemmas, outline the particular shortcomings of communication
62 during internet collaborations, and lastly overview potential solutions to these
63 challenges.

64 **2 Social Dilemmas and E-Research: The Free-Rider Problem**

65 Internet research collaborations can be classified as a public goods dilemma, a type
66 of social dilemma. The public good in this context is the research output, e.g., a
67 grant or publication. The publication is dependent on group members allocating

time, effort, and resources to the project. This is a social dilemma, because it is in each individual's self-interest to not contribute to the project, but to reap the rewards of the research output. However, if all members act this way, then there is no collective reward of research output. This is known as the free-rider problem and has been studied across disciplines in the social sciences. In fact, many social problems are public goods dilemmas, e.g., building a road, support for social programs, and donations to public television or radio. Some of these problems are easily solved by restructuring the rewards and punishments of non-contribution, e.g., a tax system. However, such formal systems are often not in place while we interact with others on collaborative research projects. To our benefit, research has provided many alternative solutions to the free-rider problem.

The free-rider problem can be addressed, broadly speaking, by either motivational solutions or structural solutions (Kollock 1998). Motivational solutions (e.g., the formation of group identity) appeal to an individual's concern for others outcomes in social dilemmas, while structural solutions (e.g., punishment) involve changing the rules and outcomes in the social dilemma. In fact, research has identified several motivational and structural solutions to social dilemmas. For example, it is well known that free-riding increases in larger groups (Kollock 1998), and therefore a structural solution to a dilemma can be reducing the group size. A project leader for an internet research project may be sensitive to this and only add additional collaborators to a project as needed. Other methods might simultaneously provide a motivational and structural solution to the dilemma, e.g., communication. Indeed, communication could be a particularly useful strategy for E-researchers to resolve the social dilemma of online research collaboration. It is well known that communication prior to a social dilemma reduces free-riding in the dilemma (Deutsch 1958; Balliet 2009). However, face-to-face discussion is more effective at reducing free-riding compared to written or computer-mediated communications (Balliet 2009). This could pose a particular problem to resolving the social dilemma of online research collaborations. To understand the limits of communication affecting free-riding in the online environment, we must consider both theory and research on communication in social dilemmas.

3 Communication and Cooperation: Why Does Communication Matter?

Deutsch (1958) initially found that allowing participants to briefly discuss the social dilemma greatly enhanced cooperation, compared to a no discussion condition. Since his seminal work, several researchers have replicated and extended these findings to many types of social dilemmas, including public goods dilemmas (Dawes et al. 1977; Kerr et al. 1997; Orbell et al. 1988). Indeed, as supported by a meta-analysis of 45 studies, communication has a strong positive effect

108 ($d = 1.01$) on cooperation in social dilemmas, compared to no communication
109 (Balliet 2009). Researchers have proposed several alternative explanations for
110 the effect of communication on cooperation, e.g., a better understanding of the
111 dilemma, enhanced group identity, more positive expectations of cooperation
112 from others, and making salient a norm of promise keeping or a benevolent
113 norm of cooperation (Kerr et al. 1997). Perhaps the most supported explanation
114 has been that communication provokes a norm that guides cooperative behavior.
115 A norm is a rule that guides behavior that is not supported by any type of formal
116 sanctioning system (Bicchieri and Lev-On 2007). For example, Bicchieri (2002)
117 proposes discussion makes salient the social norm of promise keeping. Specifi-
118 cally, this norm is thought to direct behavior only when people expect others to
119 cooperate in the dilemma. In line with this perspective, Orbell et al. (1988) found
120 that groups with leaders that pushed the agenda of getting everyone to make
121 promises were more likely to keep those promises. Bicchieri (2002) refers to
122 promise keeping as a social norm, which implies that the norm only directs
123 behavior in a social context, when others are able to evaluate one's behavior
124 according to the norm.

125 Kerr et al. (1997), however, provide some evidence that the norm that guides
126 behavior is not a social norm. Instead, it can be a personal norm that directs
127 behavior. This would have important implications, because a social norm might
128 only be followed when participants have a chance to be observed and sanctioned
129 by their group members. However, there is no need for the monitoring or sanc-
130 tioning of behavior directed by personal norms, since people will likely self
131 sanction themselves, e.g., feelings of guilt, if they violate their own personal
132 norms. If discussion induces a personal norm, then people should be just as
133 willing to donate to a public good after discussion regardless if their donation
134 is anonymous or non-anonymous. Kerr et al. (1997) observed contributions to
135 a public goods dilemma when participants were either randomly assigned to a
136 no-discussion/anonymous, discussion/anonymous, or discussion/non-anonymous
137 condition. While discussion still increased cooperation, relative to the no-
138 discussion condition, there was no statistical difference in contribution between
139 the discussion/anonymous and discussion/non-anonymous conditions. Therefore,
140 the norm of promise keeping may be a personal norm that individuals adhere
141 to regardless of the potential social sanctions for norm violations. As we will see
142 below, this may have important implications for understanding how communica-
143 tion in the online social dilemma of collaborative research projects can be used
144 to reduce the free-rider problem.

145 Given that prior research supports a norm-based perspective on the effects of
146 communication on cooperation in social dilemmas (Bicchieri 2002; Biel and
147 Thøgersen 2007; Kerr et al. 1997), I will anchor on this perspective while con-
148 sidering some specific challenges faced by online research collaborators and some
149 potential solutions to these problems. Indeed, research does suggest that more
150 troubles may arise regarding the free-rider problem in online communication
151 domains, relative to more traditional forms of collaboration (Rocco 1998).

4 Computer-Mediated Communication: Specific Challenges to Social Dilemmas

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Research on communication in social dilemmas has manipulated communication as either face-to-face discussion or written messages, e.g., written notes or via computer. In fact, a dearth of research has systematically compared these two types of communication. The few studies conducted on this topic have resulted in inconsistent findings. Some research finds that face-to-face discussion increases cooperation, relative to email or written messages (Bos et al. 2009; Frohlich and Oppenheimer 1998; Rocco 1998). However, other work finds that there is little to no difference between these two types of communication (Zheng et al. 2008, 2009). In a meta-analytic review of the effect of communication on cooperation in social dilemmas, Balliet (2009) found that face-to-face discussion had a much stronger positive effect on cooperation, relative to written notes or other forms of computer-mediated written messages. There are four reasons why face-to-face discussion results in less free-riding than written computer-mediated communication.

Bicchieri and Lev-On (2007) suggest that in face-to-face discussion the social norm of promise keeping is more salient, relative to other computer-mediated forms of communication, which lack some of the situational features that make salient the norm of promise keeping. They cite a lack of leadership during online communication as an important difference that can affect the norm of promise keeping. Orbell et al. (1988) found that groups with a strong leader who encouraged others to make promises were most successful in reducing free-riding behavior. However, it should be noted that these studies were conducted with strangers and no group was assigned a leader. During research collaborations, the principle investigator often takes leadership responsibility. However, there may still be circumstances when a leader is less clearly defined in online collaborative projects, e.g., when the principle investigator lacks leadership skills. The benefits of leadership overlap with the second reason online communication during social dilemmas results in greater free-riding: That there is often a lack of punishment for free-riding behavior in the online environment.

There is evidence and theory to suggest that discussion can either elicit a personal (Kerr et al. 1997) or social norm (Bicchieri 2002; Biel and Thøgersen 2007). If a social norm occurs, then this social norm would be more likely to direct behavior when there is some type of monitoring and sanctioning system for behavior. Indeed, there is evidence that the opportunity to observe and punish other's choices in social dilemmas adds to the effectiveness of communication (Ostrom et al. 1992). While, Ostrom et al. (1992) find that discussion alone does enhance cooperation, relative to no discussion, in a social dilemma, allowing participants to punish free-riders increases cooperation levels beyond cooperation levels when only discussion is allowed. Therefore, the relative ineffectiveness of online communication in resolving social dilemmas might be in part due to a lack of an effective monitoring

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194 and punishing of free-riding behavior. It may be useful to monitor other's behavior,
195 but are there cues that we can use to predict when a person is likely to cooperate or
196 free-ride? Research on the sight, sound, and touch of others suggests that these
197 stimuli may carry important information relevant to assessing another's commit-
198 ment to a group project.

199 A third difference between face-to-face discussion and computer mediated
200 communication is due to the lack of important information provided by the
201 physical presence of our collaborators. Bicchieri (2002) suggests that the norm
202 of promise keeping will only direct behavior when there is adequate information
203 that the other's will also cooperate in the dilemma. Therefore, people do not
204 blindly adhere to this norm and may scan the environment for cues relevant to
205 assessing the credibility of their group members commitments to cooperate. Some
206 of these cues that are used to examine the credibility of another's intention to
207 cooperate may be non-verbal communication. In many forms of online commu-
208 nication, there is a lack of important non-verbal social cues available, e.g., facial
209 expressions, eye gaze, tone of voice, and body posture. Kurzban (2001) discov-
210 ered two non-verbal social messages, oblique eye gaze and touch, both increased
211 contribution to a public good. In fact, only being able to see the other in the
212 dilemma can increase cooperative behavior (Boone et al. 2008; Wichman 1970).
213 Moreover, Wichman (1970) found while only hearing the other can raise cooper-
214 ation to levels observed in conditions when individuals are able to both see and
215 hear the other, simply seeing the other still slightly increases cooperation relative
216 to a control condition. Therefore, the absence of seeing and hearing the other in
217 computer-mediated communication may equate to less information in assessing
218 the credibility of others commitments to the project. Without this information,
219 people may be less inclined to expect their group members to cooperate and
220 therefore will be less likely to direct their behavior according to the norm of
221 promise keeping.

222 There are also other, more practical, differences between online communication
223 and face-to-face discussion that might explain the differences between the effec-
224 tiveness of these two types of communication. It is well known that face-to-face
225 communication can be more dynamic and fluid than some forms of electronic
226 computer-mediated communication. The dynamics of face-to-face discussion may
227 allow individuals to more accurately address the important issues and concerns
228 raised in social dilemmas (Rocco and Warglien 1996). If communication occurs via
229 messages being sent back and forth between individuals (e.g., a chat group), key
230 issues may be lost and the group may not sustain discussion of the most pressing
231 issues to each individual. Therefore, face-to-face discussion may simply promote
232 more cooperation in social dilemmas, compared to computer mediated forms of
233 communication, because it (1) allows for better leadership, (2) enables a more
234 effective monitoring and punishment system of non-cooperative behavior, (3) pro-
235 vides non-verbal cues to assess other group members intentions, and/or (4) it has
236 more established rules directing the conversation that allows each members primary
237 concerns to be addressed.

5 Solutions to Overcoming the Problems of Compute-mediated Communication 238

Communication 239

The above research and theory clearly outline a problem for researchers involved in online collaborative research projects. The communication that occurs online is simply less effective at reducing free-riding behavior. However, there are a few steps that can be taken to circumvent this problem. These solutions include (1) using a mixture of communication mediums, (2) frequent coordinated meetings to discuss research progress, and (3) integrated punishment and reputation-building mechanisms in online collaborative research forums. The merits of these solutions will be considered in turn.

Communication Medium. Of course, recommending researchers to have a face-to-face discussion prior to online research collaborations may contradict the benefits of these projects. However, there are few reasons to suggest that it does not and some alternative approaches can side-step this concern. First, it is imperative that researchers coordinate their efforts, because a lack of coordination may result in greater effort spent on a project, relative to if each researcher were to conduct the project on their own (Finkel et al. 2006). Therefore, in the absence of sound coordination and planning it might be counterproductive to engage in online research collaborations. With this in mind, the benefits of online research collaboration may only come at a cost of establishing alternative means of communication prior to effective online collaboration. Second, there are alternative means of communication that are relatively costless, but still as effective as face-to-face discussions in reducing free-riding behavior.

To start, the gold standard of communication in social dilemmas is face-to-face discussion. Rocco (1998) observed the decisions of people in a six-person social dilemma when participants were either allowed to communicate using electronic mail or with face-to-face discussion. Rocco found that the electronic mail condition resulted in substantially greater amounts of free-riding, a phenomenon she termed "electronic opportunism". However, in a second study, Rocco found that if the group was allowed to socialize for a brief period prior to electronic communication in the social dilemma, then there was a relative reduction in free-riding behavior. These results are promising because they suggest that an initial meeting prior to engaging in a long-term online collaborative project will help reduce free-riding while interacting online. These face-to-face discussions could be coordinated by attending similar conferences or taking advantage of grants. However, one of the main benefits of online research collaboration is that it reduces a need for the expense of meeting face-to-face. The few studies systematically examining the effects of different communication mediums on free-riding in social dilemmas finds that video conferencing and telephone communication may reduce free-riding, compared to emails or written messages.

Bos et al. (2009) find that individuals allowed to have a videoconference during the social dilemma was statistically more cooperative, compared to when participants communicated in an internet chat room. Moreover, the videoconference

281 condition was just as cooperative as a face-to-face discussion condition. Also, the
282 videoconference and face-to-face discussion groups reported greater trust of the
283 other two members of their group, relative to the chat room condition. Brosig et al.
284 (2001) also find that a videoconference, while being not statistically different than a
285 face-to-face discussion condition, resulted in greater cooperation than a no com-
286 munication condition. However, these researchers did not compare videoconfer-
287 ence to an alternative computer-mediated form of written communication. Taken
288 together, these results suggest that a videoconference, which is easily coordinated
289 given the accessibility of the current technology, can be a successful alternative
290 communication medium, especially while coordinating the initial efforts on a
291 project.

292 Is telephone communication more effective at reducing the free-rider problem
293 compared to text chat or email? Jensen et al. (2008) suggest that it is. In their
294 research, dyads were asked to make several decisions in a social dilemma while
295 being randomly assigned to one of four communication conditions: no communi-
296 cation, text chat, text-to-voice, and discussion via speakerphone. They found that a
297 speakerphone resulted in greater levels of cooperation relative to both the text chat
298 and no discussion conditions. However, the text-to-voice condition resulted in only
299 marginally significantly more cooperation compared to the no communication
300 condition. These data give credibility to the effectiveness of telephone commu-
301 nication in reducing free-riding behavior. These data also highlight the necessity
302 of hearing the other's voice. Again, this study is not exceptionally clear if text-
303 to-voice technology will help in reducing the free-rider problem. Importantly, this
304 condition did not result in statistically less free-riding behavior than the text chat
305 condition.

306 The studies mentioned above highlight two forms of communication that may
307 reduce the free-rider problem: videoconferencing and telephone. These forms of
308 communication might best be utilized at the beginning of collaborative research
309 projects. Afterwards, it might be most cost effective to continue online discussions
310 via email or chat rooms. However, it might be best to come back to these other
311 successful forms of communication periodically during the ongoing project.

312 **6 Sub-Project Goals and Monitoring Progress**

313 In a meta-analysis, Balliet (2009) found that there was not a statistical difference in
314 levels of free-riding behavior between having communication only prior to the
315 dilemma and communication allowed during the dilemma. However, these findings
316 may be relatively limited to the context of laboratory studies, which only last an
317 hour and so might not capture the dynamics of long-term collaboration projects.
318 There are a few reasons to suspect that the establishment of sub-goals and periodic
319 meetings via videoconference or telephone will increase collaborative effort in
320 achieving project goals. To begin, frequent online meetings will enable an assess-
321 ment of current progress and may bring to light any lack of effort by specific group

members. These meetings may affect free-riders in two ways. First, Miettinen and Suetens (2008) find that individuals who made promises to cooperate in a social dilemma, but then later defect, tended to feel guilt in response to learning that their partner cooperated. Therefore, not only will frequent meetings enable an assessment of progress towards group goals, but may also motivate others who have failed to deliver their promised component of the project to increase subsequent efforts. Guilt has been associated with prosocial motivations in much prior research and would likely promote subsequent cooperation (Ketelaar and Au 2003).

Periodic meetings using videoconference or telephone may also help prevent free-riding behavior by allowing individuals to express their reasons for free-riding behavior. Often individuals do have the intentions to cooperate on a project, but various circumstances may arise to prevent them from working on a project, e.g., a sick family member and other pressing work obligations. If other group members perceive the lack of effort as intentional, this may result in a spread of free-riding amongst other group members. However, research demonstrates that if individuals intend to cooperate and external circumstances prevent them from doing so, then communication reduces the spread of free-riding behavior, relative to when no communication occurs between group members (Tazelaar et al. 2004). Therefore, periodic group meetings will help prevent the spread of free-riding behavior in a collaborative group if individuals perceived as free-riders are able to provide adequate reasons why they were unable to act on their cooperative intentions and promises.

Besides using telephone or videoconference to update progress, blogs and email may be an efficient, cost effective alternative to monitoring progress towards group goals. Using these computer-mediated methods of communication for updating progress has a few advantages. First, not all members need to be present at the same time. This may be especially important in the case of international collaborations. Second, since they require less time, effort, and coordination, a more frequent schedule of updates can be utilized to monitor progress. For example, a group of collaborators may make an agreement to update a blog at the end of each week detailing their progress on the project. This strategy will raise awareness of any individual who begins to free-ride and reduce effort. If this is the case, then the threat of punishment and/or impacting the reputation of the free-rider may increase their level of cooperation.

7 Punishment and Reputation

Another possible means for improving cooperation in online research collaborations is by excluding free-riders from group projects and being able to assign reputation points to fellow researchers. As some prior research demonstrates, communication combined with a possibility for punishment results in greater levels of cooperation compared to only communication or punishment alone (Ostrom et al. 1992). It might be that simply including an option for project leaders to drop

363 non-contributors from projects may be enough to motivate project members to
364 engage effort. However, prior research has found that the threat of being excluded
365 from a group can have negative psychological effects on those potentially being
366 ostracized (Richman and Leary 2009), and this can lead to even less cooperation
367 during subsequent interactions (Twenge et al. 2007). Therefore, the exclusion, or
368 even the threat of exclusion, of free-riders is recommended as the last option.

369 More importantly, online research collaboration forums can allow researchers to
370 explicitly evaluate the past performance of their collaborators, which is then tagged
371 to their collaborators profile, thereby enabling the development of reputations, and
372 this is known to increase levels of cooperation (Milinski et al. 2002). For example,
373 MyNetResearch allows researchers to evaluate their collaborators on a scale from
374 1 to 10 (with 1 = to the most negative evaluation and 10 = the most positive
375 evaluation). These evaluation scores can be averaged over time. In fact, just the
376 awareness of a possible negative evaluation can motivate free-riders to cooperate
377 (De Cremer and Bakker 2003). Therefore, allowing people to systematically share
378 information about their collaborators, and so impact their collaborator's reputation,
379 can facilitate cooperation amongst group members. Also, this can be a mechanism
380 that enables other researchers to avoid interactions with collaborators who have
381 defected on previous projects.

382 Written online communication may not be as effective in resolving the free-rider
383 problem of online research collaboration, but all hope is not lost. As shown above,
384 surveying the literature on communication and cooperation in social dilemmas
385 makes several suggestions regarding how to sustain cooperative collaborative
386 relationships. First, using alternative means of communication (e.g., videocon-
387 ferencing and telephone) capitalize on some of the shortcomings of online com-
388 munication. The alternative communication mediums both enable the dynamic
389 rule-based communication that occurs in face-to-face discussion and make avail-
390 able social cues to assess others intentions to cooperate. By using these communi-
391 cation mediums periodically marking progress throughout the research project, this
392 may provide better oversight of others efforts and allow for collaborators to provide
393 reasons for their failures to meet deadlines. Lastly, the establishment of a mecha-
394 nism that enables individuals to develop reputations in online research forums can
395 enhance cooperative efforts and allow other's to avoid interactions with free-riders.
396 Taken together, these strategies should help researchers overcome the limitations of
397 written online communication in resolving the public goods dilemma of collabora-
398 tive research projects.

399 **8 Conclusion**

400 The promising benefits of online research collaboration are met with additional
401 challenges – one in particular is the exacerbation of the free-rider problem in the
402 public goods dilemma of research collaboration. Although, communication is one
403 of the most effective situational features of social dilemmas that can enhance

cooperation, there is evidence to suggest that online communication, compared to face-to-face discussion, is less effective at resolving the free-rider problem. The lack of effectiveness of online communication may be due to a lack of leadership, less effective monitoring and punishing of free-riding behavior, fewer non-verbal social cues to assess the credibility of others commitments, and/or the lack to norms guiding an effective discussion of the dilemma. To overcome this challenge, it is suggested that researchers consider video conferencing, telephone, and periodic project meetings assessing progress using these forms of communication, in lieu of always using email or online chat as the medium of communication. Research forums facilitating online research collaboration can also consider integrating reputation-building mechanisms that monitor past behavior of collaborators. Applying these strategies should decrease subsequent free-rider behavior and encourage cooperative productive research collaborations.

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Author Queries

Chapter No.: 17

Query Refs.	Details Required	Author's response
AU1	The citation 'Kerr et al., 2007' (original) has been changed to 'Kerr et al., 1997'. Please check if appropriate.	
AU2	The citation 'Bos et al. (2008)' (original) has been changed to 'Bos et al. (2009)'. Please check if appropriate.	