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# When Prosocials Act Like Proselfs in a Commons Dilemma

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*Past research has shown that people with prosocial orientations exercise restraint when collectively shared resources are close to being depleted, whereas people with proself orientations tend to maintain high levels of consumption. This research seeks to extend this important finding by examining whether the presence of noise in social-ecological interaction may modify the effects of social values in a commons dilemma. Participants were taking resources from a gradually declining pool. For half of the participants, the intended consumption was subject to incidental increases in consumption (negative noise). Consistent with hypotheses, noise exerted detrimental effects on cooperation when resources became scarce, yet these effects were only observed for prosocials, not for proselfs. These results indicate that noise in social-ecological interaction plays an important role in common-pool management. It tends to undermine cooperation among those who are otherwise inclined to save resources.*

**Keywords:** *social interaction; cooperation; conservation; noise; social value orientation; commons dilemma*

The collective management of common-pool resources such as freshwater or energy can be seen as an instance of the broad category of situations called social dilemmas, or more specifically as a *commons dilemma* (e.g., Hardin, 1968; Kelley et al., 2003; Kopelman, Weber, & Messick, 2002; Suleiman, Budescu, Fischer, & Messick, 2004; Van Vugt, Snyder, Tyler, & Biel, 2000). The literature on commons dilemmas has repeatedly shown that apart from tendencies toward pursuing self-interest or tendencies toward conformity, people also may exhibit a strong tendency to preserve common-pool resources from being depleted

(e.g., Messick et al., 1983; Samuelson, 1993; Samuelson, Messick, Rutte, & Wilke, 1984; Wilke, 1991). It is important that previous research has also shown that the motivation to preserve a common pool is not equally strong for everybody. Although people who seek to maximize collective outcomes (i.e., prosocials) carefully adapt their behavior to an imminent resource shortage by cutting down their consumption, people who seek to maximize own outcomes or differences in outcomes (i.e., proselfs) keep up their high consumption as if resources were still abundant (see Kramer, McClintock, & Messick, 1986).

The Kramer et al. (1986) findings illuminate that motivations are relevant to solving the social dilemma at its most important moment—when the common pool is close to being depleted. That is, differences between prosocial and proself motives seem most important when the dilemma is most pronounced and the collective consequences most severe. At the same time, experiments examining the effects of personality differences on individual resource consumption have always been conducted in a “perfect world.” Participants were usually able to realize their intended consumption without any limitations; that is, they could fully translate their

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intended actions into real effects on the pool, as if there were no external barriers or factors that might prevent them from doing so.

This perfect-world assumption is unrealistic. We suggest that people often have a lack of information about the impact of their own behavior on collective and ecological outcomes. One simply does not always know when the consequences of one's own consumption behavior may be (much) worse than it was intended. Often, people cannot fully translate their intended actions into real effects on a natural resource because they are partly lacking the means to do so or their means are not sufficient. For example, people may intend to use public transport to go to work but the schedule of public transport does not fit well with their working schedule (e.g., there is only one bus per hour on a particular line). In real life, therefore, people may often achieve their personal goals (e.g., going from A to B), but the actual social and ecological outcomes may be worse than actually intended (e.g., going by car is burning more fossil fuel than going by public transport) due to *noise in social-ecological interaction*, a concept explained in the following.<sup>1</sup>

### NOISE IN SOCIAL-ECOLOGICAL INTERACTION

For *dyadic situations*, noise is formally defined as discrepancies between intended and actual outcomes for an interaction partner due to unintended errors (e.g., Axelrod & Dion, 1988; Bendor, Kramer, & Stout, 1991; Van Lange, Ouwerkerk, & Tazelaar, 2002). If both parties act in a reciprocal manner, such unintended errors may lead to an escalation of conflict according to the so-called echo effect (Axelrod, 1984). If one party misperceives the unintended defection of the other party as an intended act of noncooperation, it may respond with intended defection in turn, which may lead to endless cycles of mutual defection. For both parties, the result of such misunderstandings may be quite bad. For example, a business deal may fail because of unrealized meetings, or a romantic relationship may break up because of misguided conversations. However, such unwanted developments can be prevented with means that may facilitate cooperation in the presence of noise, for example, generosity (Van Lange et al., 2002; Wu & Axelrod, 1995), communication (Tazelaar, Van Lange, & Ouwerkerk, 2004), or empathy (Rumble, Van Lange, & Parks, 2005).

For social interaction in *n-person situations*, in contrast, noise has not yet been examined, as far as we know. At the same time, noise is a fact of everyday life, in dyadic as well as *n-person situations*, whether they only include social interaction within a group (e.g.,

providing a collective good) or whether they additionally include the social-ecological interaction between a group and a natural resource with its own characteristics, such as an own regeneration rate. What are some examples of discrepancies between intended outcomes and actual outcomes for the collective and for the resource in commons dilemmas? We would suggest that people may not always have complete information about the magnitude of the detrimental effects of some forms of consumption or indeed, that they are consuming too much, or they do not realize how severely their consumption contributes to the depleting of natural resources. We all perform a multitude of consumption behaviors in everyday life. Some of them may be more prone to noise than others, as we do not always know in advance to what extent we are able to realize our desired impact on natural resources, and unfortunately, our "ecological footprint" may often be bigger than we actually intended—at least, as often suggested by environmental scientists.

Noise, then, may be seen as external barriers, partly or fully out of people's control, by which they literally cannot translate their cooperative intentions into conservation consumption behaviors in their everyday life. For example, despite conscientious attempts to reduce the use of water during a drought, people may not be fully able to do so because their sanitary installations are not allowing for a careful use of water (e.g., the toilet's flusher may not be adjustable). Or despite intentional attempts to reduce one's own car use during times of hot weather and increased levels of ozone on the ground, people may not be able to use public transport because it does not run at the appropriate times. Hence, it does not seem hard to generate examples of noise in *n-person situations* of social-ecological interaction. In each of these examples, prosocial and ecologically motivated behavior is constrained by the presence of noise, and people get feedback that natural resources are in a bad state and in decline. We will show that it is this combination of noise and the feedback about declining resources that is leading to detrimental behavioral effects in persons with prosocial motivations. For that, we first need to discuss the concept of social value orientation in greater detail.

### SOCIAL VALUE ORIENTATIONS AND NOISE IN A COMMONS DILEMMA

Social value orientations have shown to be predictive of consumption behavior in a commons dilemma (e.g., Kramer et al., 1986; Parks, 1994). Prosocials (i.e., cooperative individuals), in contrast to proselves (i.e., individualistic or competitive individuals), are assumed to follow the

goal of maximizing as well as equalizing collective outcomes (Kelley & Thibaut, 1978; Van Lange, 1999). In a commons dilemma, this combined goal, especially the part of maximizing joint outcomes, can only be satisfied with maintaining the common pool as long as possible. The longer the group can consume from the pool, the higher will be the collective outcome in the long run. Therefore, it seems safe to assume that prosocials, compared to proselfs, should have a stronger motive to preserve the pool.

Indeed, Kramer et al. (1986) have shown that prosocials try to prevent an imminent collapse of the pool, whereas proselfs continue harvesting without adapting to a situation of scarcity. But when prosocials realize that their deliberative attempts to preserve the pool are fruitless due to noise in their consumption decisions, and the pool is deteriorating anyway, they may stop conserving and begin pursuing the goal of equality in outcomes by taking as much as they believe others do. The behavior of proselfs, on the other hand, should not be affected that drastically by the presence of noise, as their motivation to preserve the pool is low in any case (see Kramer et al., 1986).

Besides the social value orientation of a decision maker, we presume the actual pool size to be another moderator for the effects of noise on consumption behavior. Several models of human resource use (e.g., Brucks, 2004; Mosler & Brucks, 2003; Wilke, 1991; see also Gifford & Hine, 1997) propose that the conservational motive of an individual is particularly strong when the pool is perceived as deteriorating. A large body of research (e.g., Messick et al., 1983; Samuelson et al., 1984) supports this notion with the observation that many people—especially prosocials, as was explained above—adapt to a reduction of pool size by cutting down their consumption. Therefore, we assume that the detrimental effects of noise should be particularly influential when people get the feedback that the resource is in decline, as noise may weaken their motive to preserve the pool from being exhausted.

## RESEARCH DESIGN AND HYPOTHESES

For this research, we used a repeated commons dilemma task with preprogrammed feedback about the pool size. The participants were made to believe that they managed a common pool in groups of five, that the pool size steadily decreased over the 24 trials of the task, and that the group finally emptied the pool for similar designs, (see Brucks, 2004, or Roch & Samuelson, 1997).<sup>2</sup> Participants received no feedback at all about others' behavior. To make sure that participants attributed the cause for the decline of the pool to the—potentially noisy—behavior of the group, and not to the pool

dynamics themselves, we informed them that the regeneration of the pool is kept constant in all trials. As in previous studies on noise (e.g., Van Lange et al., 2002), participants could make a continuous choice on an interval scale, in this case between 11 options to consume from 0 to 10 points from the common pool on each trial.

Half of the participants were told that the computer is changing their consumption decisions from time to time by adding between 0 and 2 points to their actual choice (i.e., noise). In noisy trials, participants did receive whatever number of points they asked for but the computer did possibly take out 0, 1, or 2 points more than that out of the pool. This way, noise had potentially negative effects on the pool size but no effects—neither positive nor negative ones—on the immediate outcome for the participant. As an analogy to real life, people always achieved their goals (e.g., heating the apartment), but the effects of their behavior on natural resources (e.g., the fuel consumption) were worse than intended. We informed participants in the noise condition beforehand that such a modification of their choice could happen in any trial of the task. However, in only 9 predetermined trials of all 24 trials (i.e., in 37.5%) did they actually get feedback that the computer had modified their choice after they had already made it. Furthermore, such incidents of noise were supposed to occur to all members of the group in the same fashion but not necessarily at the same time and with the same frequency.

Based on the line of reasoning presented earlier, we anticipated that the detriment of noise would be especially pronounced for individuals with prosocial orientation rather than for individuals with proself orientation. Moreover, we hypothesized this pattern only when overconsumption would really matter (i.e., when the resources are close to being depleted) rather than when the pool is abundant and can afford a good deal of consumption. Thus, we expected that cooperation would be influenced by all three variables under study such that noise exerts detrimental effects on levels of cooperation for prosocials (and less for proselfs) when the resources are scarce rather than abundant.

## METHOD

### Participants and Experimental Design

A total of 176 undergraduate students—107 women and 69 men, with an average age of 21 years—of a large Dutch university took part in this study and were paid €5 in exchange for participation (this equaled about US\$6.70). Furthermore, they were told in advance to enhance their chances in a lottery for about five cash

**TABLE 1:** Means and Standard Deviations of Individuals' Consumption Behavior by Pool Size, Social Value Orientation, and Noise

Noise	Pool Size	Social Value Orientation		Total M	Grand M
		Prosocials ( <i>n</i> = 68)	Proselfs ( <i>n</i> = 67)		
		M (SD)	M (SD)		
No noise ( <i>n</i> = 68)	Big	6.20 (1.97)	6.79 (1.50)	6.49	6.34
	Small	5.61 (2.52)	6.82 (2.19)	6.19	
Noise ( <i>n</i> = 67)	Big	5.79 (2.05)	6.76 (1.59)	6.28	6.48
	Small	6.76 (2.81)	6.58 (2.11)	6.67	
Grand M		6.10	6.74		6.41

NOTE: Higher values represent higher levels of consumption on a 0-10 scale.

prizes of €10 with each point they made in the commons dilemma task.

The experimental design was a 2 (social value orientation: prosocial vs. proself)  $\times$  2 (noise: no noise vs. noise)  $\times$  2 (pool size: big vs. small) ANOVA, with the former two variables being between-subjects variables and the latter variable being a within-subjects variable (for means, see Table 1). Participants were randomly assigned to the noise and no-noise conditions. The dependent variable was the level of consumption from the common pool.

### Procedure

Upon arrival in the laboratory, each participant was greeted and escorted to one of seven cubicles, equipped with a personal computer, which prevented any kind of contact between participants during the whole session. The stimulus material of the experiment was presented on a computer screen using a program written in Authorware Professional (Version 7). Participants responded by using the keyboard of the computer.

After being welcomed, participants were informed that the study would last between about 30 to 40 min. Then, they were told that the study would consist of two parts that were presumably unrelated to each other. In the first part, their social value orientations were assessed by means of a commonly used decomposed games measure. In the second part, participants engaged in the commons dilemma task. Thereafter, they indicated their age and gender. After completion, participants were asked to leave the cubicle and were thanked, paid, and debriefed. In the following, we describe each part of the study in detail.

*Assessment of social value orientations.* Participants' social value orientations were assessed with the nine-item decomposed game measure—described in detail in Van Lange, Otten, De Bruin, and Joireman (1997)—that is known to be a valid and reliable method of measuring interpersonal orientations (e.g., De Dreu & Boles, 1998; Kuhlman, Camac, & Cunha, 1986; McClintock & Allison, 1989; Parks, 1994; Van Lange & Kuhlman, 1994). Participants were asked to decide nine times how they wanted to split up points between themselves and another person. The other was said to be someone that they did not know and that they would never knowingly meet in the future so as to examine participants' general tendencies toward others. The instructions briefly note that the other will be making choices so as to induce some interdependence between the participant and the other. Outcomes were presented in terms of points, and participants were asked to imagine that the points had value to themselves as well as to the other person. Similar instructions have been used in past research (e.g., see Kuhlman & Marshello, 1975; Van Lange, Agnew, Harinck, & Steemers, 1997). In each decision, they had the choice between a cooperative option (i.e., maximizing joint outcomes), an individualistic option (i.e., maximizing own outcomes), and a competitive option (i.e., maximizing relative differences).

Participants were classified as either prosocials if they chose six times or more the cooperative allocation of points, or they were classified as proselfs if they chose six times or more the individualistic or competitive allocation of points. As in previous research, individualists and competitors were pooled to proselfs, as they share the motive to maximize own outcomes, either in an

absolute or in a relative sense. According to these criteria, 68 participants (38.6%) were classified as prosocials and 67 (38.1%) as proselves. Forty-one participants (23.3%) could not be classified because they made fewer than six consistent choices. Although the percentages of unclassifiable participants may seem rather high, it is actually not much different from some past research using even large samples (e.g., Van Lange, Agnew, et al., 1997). Therefore, all subsequent data analyses have an  $n$  of 135 instead of the original 176.

*Commons dilemma task.* After completing the instrument for assessing social value orientations, participants received instructions that they are getting connected with four others in the laboratory via a computer network in order to work on an independent group task. In these groups of five, they were supposed to share a common pool of points. They learned that each one could take between 0 and 10 points out of the pool, all at the same time. After each and every one had made a decision, the computer would multiply the remaining number of points by 1.5. Then, a new round would begin where points could be taken out of the pool again. The group task would go on like this until the pool was empty or until the experimenter stopped it. A numerical example was presented: If the pool had 50 points and the participant decided to take out 5 points, whereas the other group members take 0, 3, 4, and 8 points, respectively, the collective usage in that particular round would be 20 points to be subtracted from the pool. The remaining 30 points get multiplied by 1.5, which leaves 45 points in the pool for the next round.

As an incentive to take as many points as possible, participants received information that each point they take out of the pool would be equal to a raffle in a lottery being held after the completion of the study. The more points they make, the higher would be their chances to win one of the additional cash prizes of €10. At the same time, they were introduced to the dilemma structure of the task with an example: If the pool had 75 points in the first round, and the average consumption was 7 points per round, then the pool would last for three rounds, and everyone would have made 21 points on average. However, if the average consumption was only 6 points per round, the pool would last for four rounds, and everyone would have made 24 points on average. It was stressed again that the task would be over as soon as the pool was empty. After completion of the study, five participants were randomly drawn—independently of their final outcomes in the commons dilemma—and informed via e-mail that they had won a cash prize.

Before the commons dilemma task began, we checked participants' understanding of the instructions with four

questions. Only if a participant answered all four questions correctly he or she could proceed to the commons dilemma task; otherwise the test had to be repeated. After successfully passing the comprehension test, a waiting screen was presented where participants were told that they had to wait for other group members who had not yet finished with the instructions in order to begin with the group task simultaneously.

*Manipulation of noise.* The present manipulation of noise has been tested and applied successfully in previous research with dyads (e.g., Tazelaar et al., 2004; Van Lange et al., 2002). To participants in the experimental group (i.e., with noise), it was emphasized that decisions in everyday life sometimes have different consequences than intended and that such uncertain outcomes would be part of their group task. They learned that from time to time, the computer would modify their decisions by adding 0, 1, or 2 points to their intended consumption. So they would always get as many points as they wanted, but the number of points subtracted from the pool could be bigger than that. The computer could perform such a modification in any trial without telling them in advance. They were reminded in every round of the task before making a decision that a modification could possibly happen. Only after they had already made a decision did they receive feedback whether the computer had actually modified it. Finally, they learned that all members of the group were affected by the modifications of the computer but not necessarily at the same time and with the same magnitude. With this manipulation, in analogy to real life, participants always achieved their immediate goals (e.g., going from A to B), but the consequences for the pool (e.g., the level of fuel consumption) were sometimes worse than actually intended due to noise (e.g., the restricted access to public transport), a fact that they realized only after having made a choice.

*Manipulation of pool size.* Also, the present manipulation of pool size has been applied repeatedly and tested successfully in previous research (e.g., Brucks, 2004; Kramer et al., 1986; Roch & Samuelson, 1997). The size of the pool was manipulated within-subjects by giving participants preprogrammed feedback about the availability of points in the pool. Two states of the pool were simulated (i.e., big vs. small): In the first 12 rounds (i.e., big pool), participants observed a pool that increased from 75 to 93 points and then decreased again down to 65 points (i.e., 75, 71, 79, 84, 93, 88, 80, 75, 71, 66, 59, and 65). This development should represent a more or less sustainable management and a big pool. In the second 12 rounds (i.e., small pool), they

received feedback that the pool continuously decreased from 57 points down to 11 points (i.e., 57, 52, 46, 41, 38, 33, 26, 32, 24, 20, 16, and 11). This development should represent severe overuse and a small pool. In each round, the participants were informed about the absolute number of points left in the pool and about the development relative to the previous round (e.g., “the pool contains 57 points in the present round, which is a decrease of 8 points since the last round”). After 24 rounds, participants read that the group had emptied the pool and the task was over.

*Measurement of dependent variables.* The dependent variable of this study is participants’ consumption from the common pool, measured in each round as the number of points taken out of the pool. Due to the within-subjects manipulation of pool size, we pooled the first 12 repeated consumption decisions (i.e., big pool) and the second 12 decisions (i.e., small pool).

## Results

The overall consumption in the 24 rounds of the commons dilemma task averaged 6.41 ( $SD = 1.89$ ) points per round. This is significantly more than a sustainable individual choice would be, even when the pool had as much as 93 points in round five, and a sustainable choice would have been 6 points,  $t(134) = 2.5$ ,  $p < .01$ . This shows that in general, participants took more points than the regeneration rate of the pool would have allowed for sustainable management. In other words, it is very likely that most groups would have overused the common pool if its size had really been dependent on the participants’ choices, leading to a similar decline of the pool as the simulated one. In the following, we decompose this overall mean with a 2 (social value orientation: prosocials vs. proselfs)  $\times$  2 (noise: noise vs. no noise)  $\times$  2 (pool size: big vs. small) ANOVA, the latter variable being a within-subjects variable (for means, see Table 1).

First, the analysis revealed the widely known main effect for social value orientation,  $F(1, 131) = 3.97$ ,  $p < .05$ ,  $\eta^2 = .04$ . Across all conditions and over the whole course of the task, proselfs ( $M = 6.74$ ,  $SD = 2.31$ ) exhibited greater consumption than did prosocials ( $M = 6.10$ ,  $SD = 1.89$ ). More important, the analysis also revealed a three-way interaction between social value orientation, noise, and pool size,  $F(1, 131) = 6.30$ ,  $p < .05$ ,  $\eta^2 = .05$ . Most interesting in this rather complex pattern of means is the comparison between proselfs and prosocials. As can be seen, for proselfs the level of consumption did not vary much across the four conditions (i.e., it ranged from 6.58 to 6.82), and indeed, the simple two-way interaction of pool size and noise was not significant for proselfs,  $F(1, 65) = 0.16$ , *ns*.<sup>3</sup> In contrast, for

prosocials the level of consumption varied quite strongly across the four conditions (i.e., it ranged from 5.61 to 6.76), and we found a significant simple interaction effect between pool size and noise for prosocials,  $F(1, 66) = 10.68$ ,  $p < .01$ ,  $\eta^2 = .14$ .

We further examined this latter interaction by analyzing the simple main effect of pool size for prosocials in the condition where noise was absent and in the condition where noise was present. In line with previous research, in the absence of noise prosocials adapted to a deteriorating pool by reducing their consumption from 6.20 to 5.61 points,  $F(1, 34) = 6.15$ ,  $p < .05$ ,  $\eta^2 = .12$ . Supporting our hypothesis about the effects of noise, in the presence of noise prosocials increased their consumption instead from 5.79 to 6.76 points,  $F(1, 32) = 6.03$ ,  $p < .05$ ,  $\eta^2 = .16$ , when the pool deteriorated. Thus, prosocials’ reaction to a deteriorating pool changed drastically in a noisy environment.

## DISCUSSION

These results indicate that noise plays an important role in common-pool management in that it undermines cooperation among those who are otherwise inclined to exercise restraint by saving resources. The major findings are twofold. First, as predicted, when the resource pool is close to being depleted, prosocials no longer exercised restraint under conditions of noise and exhibited levels of consumption that are similar to that of proselfs. Second, the present findings provide a perfect replication of the Kramer et al. (1986) findings when noise is absent; however, when noise is present, prosocials come to behave in a manner that is “normally” typical of proselfs. Below, we briefly discuss the meaning of these findings and their implications, as well as some strengths and limitations.

One important contribution of these findings is that they provide evidence in support of the claim that noise matters not only in dyadic situations but also in  $n$ -person situations. It is good to realize that  $n$ -person situations may often be as noisy as, or even noisier than, two-person situations. The  $n$ -person situations are more complex; the availability of information is more limited and more of a challenge. In an  $n$ -person commons dilemma situation, people may often not be able to translate their good intentions into appropriate conservational behavior due to external barriers that prevent them from doing so. For example, in many cases people are simply lacking the means to act in a pro-environmental manner (e.g., a partial absence of public transport), or these means are simply not efficient enough (e.g., insufficient sanitary installations such as a nonadjustable flusher). It may be—according to

the present results—that the awareness of noise is leading to a reduced drive to obtain environmentally friendly and collectively beneficial results when people get the feedback that the resource is in decline. The lesson learned for real resource crises is, therefore, that people have to be provided with as much experienced control as possible to act in a conservational manner (e.g., providing the means to conserve; providing feedback about individual consumptions).

Second, these findings provide evidence in support of the notion that prosocials, who are usually prone to preserve a common pool, are much more affected by the presence of noise than proselves, who are usually prone to overconsume. Therefore, the present findings can be considered as evidence that noisy environments do indeed harm people's motivation to reach a certain goal in commons dilemmas, *and* that people with prosocial orientations are the ones whose motivation is most seriously undermined by noise. Moreover, these effects were observed when the consequences for the collective were most severe—that is, when the collectively shared resources are close to being depleted. Such findings may be observable in everyday life in a variety of ways. Consider, for example, an environmentally concerned person (a “green” person) who is highly motivated to make an effort to maintain a clean environment. This person may normally behave in an environmentally friendly manner but may cease to do so when (a) most others do not seem to make an effort, *and* (b) when external barriers do not favor environmentally friendly behavior. Generally, one may speculate that it takes both a supporting social environment (e.g., others should also make an effort; see Schroeder, Jensen, Reed, Sullivan, & Schwab, 1983) and a supporting physical environment (e.g., the experienced control over behavioral options such as the appropriate availability of public transport) for prosocials to persist in their concern with collective interest.

Third and finally, this study also complements laboratory research on cooperation and competition in general (e.g., Kopelman et al., 2002; Suleiman et al., 2004; Van Vugt et al., 2000). Social dilemma studies in the laboratory, but also in the field, have almost exclusively been designed as situations in which noise was not represented. However, in everyday life noise seems to be the rule rather than the exception. Prosocials' radical shift of behavior from careful conservation of a scarce resource to overusing the available resources shows that researchers have to be careful in generalizing findings observed in noise-free social dilemma tasks to social dilemmas in the real world.

### Strengths, Limitations, and Future Directions

The inclusion of the concept of noise, as an unintended error in the interaction of dyads or barriers to individual

motivated behavior in groups, seems to be a promising pathway to provide laboratory studies with greater ecological validity. Indeed, the present findings are a prime example of the kind of knowledge gain we can make by conducting studies on noise in social-ecological interaction. The methodological approach of replicating past studies involving no noise and extending them with an experimental condition of noise is well suited to demonstrate that noise can make a big difference.

Some limitations of this study are also noteworthy. To begin with, the hypothesis predicting detrimental effects of noise for prosocials was based on the assumption that prosocials become less motivated to preserve the pool in the presence of noise because their attempts to preserve the pool appear to be futile. Although this line of reasoning is plausible, the present research did not include measures to illuminate the mechanisms underlying prosocials' tendency to no longer exercise restraint under noise, even when the resources are close to being depleted. Hence, for future research it becomes important to assess the specific motivational processes underlying the radical change in prosocials—from default prosocial behavior to overconsumption. In the following, we offer some interpretations of the explanatory potential of some mechanisms that may inform us about future avenues for research and applications regarding commons dilemmas.

The pattern of data in the noise condition may remind us of the so-called overassimilation effect first described by Kelly and Stahelski in 1970 and often replicated in dyadic interactions. When prosocials are facing constant noncooperation, they begin to assimilate that behavior and become equally or even more competitive. As such, the overassimilation effect would explain the behavior of prosocials in the noise condition. However, it is interesting to note that past research on the commons dilemma (e.g., Kramer et al., 1986) has revealed a reverse tendency. Prosocials facing a decreasing resource due to overconsuming others do *not* at all tend to assimilate such noncooperative behaviors. In fact, they seem to disregard the noncooperative actions of others and continue to contribute to saving resources by behaving cooperatively. With our control condition (no noise), we replicated this finding, thereby showing that the overassimilation effect appears to be neutralized when a common pool has to be managed. Therefore, we have no reason to believe that the overassimilation effect may account for the different behavior of prosocials in the presence of noise. The key question then becomes, If they do not assimilate to noncooperative behavior in the absence of noise, why do they do so in the presence of noise?

We suggest that a plausible explanation for these findings may be derived from the literature on perceived



efficacy in social dilemmas (e.g., Kerr, 1989; Kerr & Kaufman-Gilliland, 1997). Specifically, we suggest that repeated experience of noise in a commons dilemma may leave people with a partial reduction of perceived efficacy because their deliberate attempts to save the pool from being depleted are getting corrupted by an external agency out of their control. In turn, such a perceived lack of efficacy may lead to feelings of reduced personal responsibility for the common pool in the sense of “I can’t help it anyway” (see also Schwartz, 1970, 1977). People may only feel responsible for the fate of the common pool if they perceive themselves to have the means to influence its future development, and noise may undermine such (feelings of) perceived efficacy. Reduced feelings of responsibility and efficacy may ultimately lead to decreased levels of conservational motivation. People may only be motivated to conserve resources if they can clearly see the effects of their attempts, and as a consequence, they take over a piece of the collective responsibility for the common pool. As the conservational motivation of prosocials is naturally higher than the one of proselfs, it seems plausible that they suffer more from the presence of noise and get less motivated to save resources, whereas proselfs may be less affected by noise and therefore tend to continue in their high levels of consumption whether noise is present or not.

At the same time, the above account is not to deny other interpretations. For example, it is possible that negative forms of noise reinforce noncooperative actions, because negative noise may make people somewhat familiar with noncooperative actions (e.g., experience the fruits of it) or they may believe—largely erroneously, we suggest—that they cannot correct a possible negative image following from negative noise. Although these interpretations do not seem very plausible, given our instructions that emphasized the third agent (i.e., the computer) bringing about noise, these specific mechanisms cannot be ruled out and are open to future research.

Also, it would be useful to assess social value orientation a substantial period of time prior to the commons dilemma to ensure that the findings cannot be explained in terms of one of the self-presentational tendencies, such as the tendency to appear consistent. Related to this issue, the present measurement of social value orientations and a typical commons dilemma task share a good deal of methodological variance, which may explain the strong main effect of social value orientation that is typically found (see Camerer & Fehr, 2005). And last but not least, the present research could be extended by increasing the stakes (e.g., such as increasing the personal benefits of consumption) in order to ensure that the participants are taking the task seriously.

## Concluding Remarks

It is an undeniable fact of everyday life that you can’t always get what you want. Similarly, in commons dilemmas one cannot always reach good collective outcomes even if one is strongly interested in pursuing that goal. The present findings suggest that prosocial goals may be fairly strongly undermined by an unsupportive physical environment, which is represented by external barriers to conservational behavior—or noise in social-ecological interaction. It was observed by Kramer et al. (1986) that prosocials may largely persist in resisting tendencies to overconsumption even when the common pool is close to being depleted. We know now that this conserving motivation may be seriously undermined by the presence of noise—a feature that we believe is frequent in real-life commons dilemmas. Although the findings may convey some pessimism regarding common-pool resources that are close to depletion, we suggest that it is important to know what can go wrong—when and why. We think we have shown what can go wrong and when, and further research must show why exactly it goes wrong.

## NOTES

1. For this particular application of the concept of noise within social-ecological interaction, we focus on *negative* noise only (see Van Lange, Ouwerkerk, & Tazelaar, 2002), in that the actual effects of individual consumption on the pool are worse than intended. The definition of *positive* noise, in contrast, would be that the actual outcome of behavior is better than intended. However, we suggest that first, it is more often the case that people’s consumption decisions have worse outcomes for common-pool resources than intended, and that second, and even more important, worse actual outcomes are of higher relevance, motivationally as well as socially and ecologically.

2. Granted, a methodologically superior design would counterbalance the manipulation of pool size by confronting a group of participants with a scarce pool in the beginning that is steadily increasing over time, perhaps along with adding a control condition representing no change in pool size. We did not do so because the design would become rather demanding in terms of number of participants, and, as assumed in much previous research (e.g., Roch & Samuelson, 1997), there is good reason to believe that in everyday life commons dilemmas often represent a decline in pool size over time. Therefore, adding the other conditions is still not ideal as it may confound realistic situations with ones that are somewhat less realistic.

3. Although one could consider using the overall error term in testing simple main effects, we followed in part Keppel and Zedeck (1989, pp. 323-327), who argue that for designs involving between-subject and within-subject variables, it is useful to consider separate error terms. In fact, in the present study, this conservative approach still yielded significant effects, thus providing strong evidence for the statistical reliability and magnitude of the effects (i.e., effect sizes varied between .12 and .16).

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