Rational Order Effects in Responsibility Attributions

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Abstract

Two experiments establish a rational order effect in responsibility attributions. Experiment 1 shows that in a team challenge in which players contribute sequentially, the last player's blame or credit for a performance is reduced if the team's result is already determined prior to his acting. However, credit and blame attributions still vary with quality of performance in these cases. This finding is at odds with Spellman (1997) who proposed that a person's perceived contribution varies with the degree to which it changes the probability of the eventual outcome. Experiment 2 illustrates that the rational order effect does not overgeneralize to situations in which the experienced order of events does not map onto the objective order of events. The quality of the last person's performance is only discredited if she knew that the result was already determined.

Keywords: responsibility attribution; causal chain; order effect.

Introduction

Consider you are the manager of your country's soccer team in the next world cup. After a nerve-wracking final ending in a draw, the winner has to be determined through a penalty shoot-out. You have already chosen five players from your team but you are still undecided about the order in which they shall shoot. You feel that later shots are more important than earlier ones but you also know that the game might already be decided before the 5th player gets to shoot. Should you put your best striker first or last? A similar problem occurs when thinking about the order in which runners should run in a team relay. In this paper, we are interested in people's perceptions of the extent to which individuals carry responsibility for their group's result in situations in which the group members contribute sequentially.

Chains comprised of several events that eventually lead to a positive or negative outcome are an interesting test field for attribution theories. According to a simple counterfactual analysis, each of the events qualifies equally as a cause of the effect. If any of the events in the chain had not occurred, the effect would also not have occurred. However, several studies have shown that there are systematic differences as to which events in a chain are judged as being more causal (Miller & Gunasegaram, 1990) or more likely to be mentally undone in order to prevent the outcome from happening (Wells, Taylor & Turtle, 1987). Different theories have been proposed to answer the question of what guides people's differential evaluation of individual events in chains.

One important factor influencing whether earlier or later events in the chain are more likely to be seen as important is the dependence relation between the events. In a *causal* chain, later events are (causally) dependent on earlier events. In a *temporal* chain, the individual events are largely independent of each other.

Wells et al. (1987) describe a scenario in which an actor arrives late due to a causal sequence of events. They showed that people exhibit a primacy effect for causal chains. The earliest event was rated as a greater cause of his lateness than any of the subsequent events. In contrast, Miller and Gunasegaram (1990) demonstrated a recency effect for temporal chains. In a scenario in which two players only gain a prize if both of their pennies match after a sequential coin flip, 92% of the participants indicated that if the coins are mismatched then the player who went first is more likely to blame the second player than vice versa. However, the mapping between type of chain and the tendency of focusing on earlier versus later events is not perfect. N'Gbala and Branscombe (1995), for example, have shown that later events *can* be seen as more important in a causal chain.

In a very influential paper, Spellman (1997) proposed a unifying theory to explain the differences in attributions. Rather than focusing on different types of chains, Spellman argued that people's intuitions can be accounted for by assuming that they engage in a process akin to a stepwise multiple regression in which the probability of the effect is evaluated after each of the events in the chain has occurred. The *crediting causality model* (CCM) predicts that an event's perceived causal contribution varies with the extent to which it changed the probability of the eventual outcome. The more an event changes the outcome's probability, the more it is judged to be causal.

For example, consider the coin flip scenario described above. Before the first player flips her coin, the probability of the team winning the prize is 50%. Since both players' coins have to match, the probability of winning remains unchanged after the first person's flip. However, after the second person flipped his coin, the probability of winning goes either up to 100% if he matched the first player's coin or down to 0% if he failed to match. Since the probability change due to the first player is 0% and due to the second player 50%, the model correctly predicts that people will judge the second player as being more causal then the first player.

Since its proposal, several shortcomings of the CCM have been demonstrated. Importantly, because the model predicts causality ratings merely based on the notion of probability change it is insensitive to the way in which these changes are brought about. However, studies have shown that voluntary human actions are preferred over physical events as causes (Lagnado & Channon, 2008) even when the change in probability is identical (Hilton, McClure & Sutton, 2010). Furthermore, Mandel (2003) has shown that a later event can receive a higher causal rating even though an earlier event has already increased the probability of the outcome to almost certainty. If an actor has been poisoned first but is then killed in a car crash, people select the car crash as the cause of death rather than the poison despite the fact that the poison had already increased the probability of death to certainty. Mandel (2003) suggests that people prefer to select as causes those events that are sufficient to bring about the outcome, whereas they tend to select events that were necessary for the outcome when asked how it could have been prevented.

A factor that has been largely neglected in the psychological literature on attributions of causal responsibility in chains is *performance*. The quality with which an action is performed normally corresponds closely to the degree of probability change in the outcome. For example, the probability with which a good result is achieved in a supply chain varies closely with how well each worker does his job. However, the tight coupling between quality of performance and change of probability in the outcome is sometimes broken. The context of team sports in which individual players contribute sequentially to the team's outcome provides an ideal test case where the individual performances and the respective changes in the probability of the result can be dissociated. Consider the example of a team relay mentioned earlier. If the performance of the first three runners in a team was very poor, the probability of the team winning before the fourth runner is essentially zero and cannot be increased anymore irrespective of the fourth runner's performance. The question is now whether the extent to which the fourth player is seen as responsible for the team's loss will still vary with how well he ran, despite the fact that the probability of the team winning is now independent of the quality of his performance. This effect could not be accounted for by the CCM.

In Experiment 2 of Spellman (1997), a game-show scenario is described in which two players, Allen and Barry, perform their tasks sequentially. If Allen performs his task well, Barry gets the easier of two possible tasks. If Allen performs poorly, Barry gets the harder task. The team wins if Barry succeeds in his task. In one condition, for example, Barry was described as having a 90% chance of succeeding in the easier task and a 10% chance of succeeding in the harder task. The results showed that participants' causal contribution ratings varied closely in accordance with the CCM. Which of the two players was rated as more causal depended on the degree to which each of them changed the probability of the eventual outcome. While in many of the cases the quality of Allen's performance influenced the probability that Barry would succeed in his task, there was also a set of cases in which the probability of Barry succeeding in his task was independent of Allen's performance. That is, Barry was described as being equally good in the two possible tasks. Interestingly, despite the fact that in these situations the probability of the team's result did not vary with the quality of Allen's performance, participants' causal contribution ratings did.

In situations in which the team won, Allen's causal contribution was rated higher when he performed his task well compared to when he performed his task poorly. Similarly, in situations in which the team did not win the prize, Allen's contribution to the result was rated lower when he performed well compared to when he performed poorly. This result has not been discussed by Spellman (1997) or by any of the subsequent studies that have tested her model. While in Spellman's (1997) experiment, the team's final outcome is always determined by the last player in the chain, there are situations such as the team relay described above in which the outcome can already be determined by an earlier event in the chain. Will an identical performance of a later player in the chain be evaluated differently depending on whether the team's outcome was already certain or still open?

The present paper explores how (i) quality of performance and (ii) the extent to which a contribution was critical to the result, as measured by the change of probability in outcome that it induced, affects people's perceptions of how responsible each contribution was for the eventual outcome. In line with CCM, we expect that the extent to which an identical performance will be seen as responsible for the team's result varies depending on whether the result was already determined or not. However, in contrast to the predictions of the CCM, we expect that the quality of performance influences how responsible a player is seen for the team's outcome, even in situations in which the result is already determined.

Experiment 1

Participants acted as external observers evaluating the performance of different teams in the qualifiers of an invented sport (similar to gymnastics) for the London Olympics 2012. Each of the 32 countries is represented by a team of three athletes. The athletes perform their routines individually and receive a score from a panel of judges ranging from 0 (= very bad performance) to 10 (= excellent performance). Participants were instructed that the average performance in the competition was 5 points. A country qualifies for the Olympics if its team scores 15 or more points in total. How many points over and above 15 a team scores does not make a difference. Participants were informed that the athletes perform their individual routines *sequentially* and that later athletes know how their previous teammates have performed. For each of the 32 teams, participants experienced two different phases. In the *probability rating phase*, they saw the scores of each of the three athletes sequentially and, after each athlete's score, indicated on a slider how likely they thought that the team would qualify (see Figure 1). The slider ranged from 0 ('definitely not') to 100 ('definitely yes') and was initialized at the midpoint. The progress bar at the top of the screen

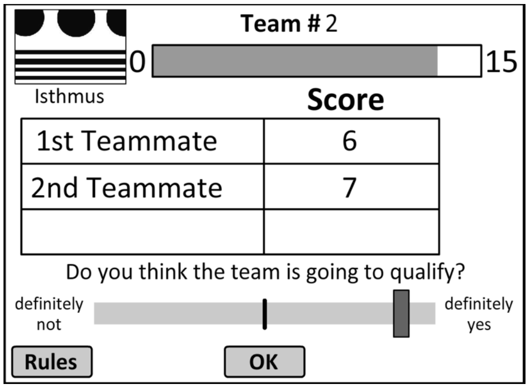

Figure 1. Screenshot of the probability updating phase.

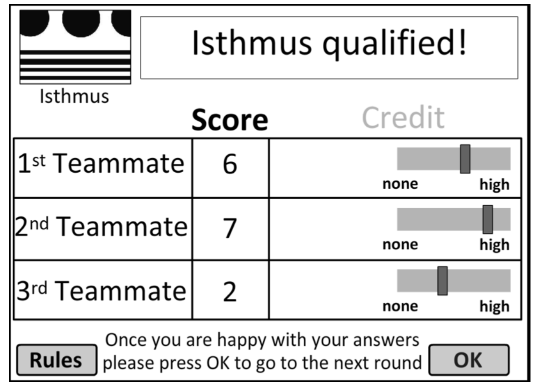

Figure 2. Screenshot of the responsibility attribution phase.

showed how many points were still required for the team to qualify and was updated after each athlete's score. Once the team qualified, the progress bar turned green. If the team could not qualify anymore, the bar turned red.

In the *responsibility attribution phase*, each athlete's score was shown simultaneously in a table (see Figure 2). Participants were asked: "To what extent is each of the athletes responsible for their team's success or failure to qualify?" If the team qualified, participants attributed credit (green sliders ranging from the center to the right). If the team did not qualify, participants attributed blame (red sliders ranging from the center to the left). The sliders for each athlete ranged from 0 ('none') to 10 ('high') and could be moved independently, that is, they did not have to sum up to a certain value.

Table 1 shows 24 of the patterns of scores that were used in the experiment. We systematically varied the scores of the 3rd athlete as either low (*mean score* = 3) or high (*mean score* = 7) for different scores by the first two athletes. This approach allowed us to compare how an identical performance of the 3rd athlete was evaluated as a function of whether the results was already *certain* prior to his performing or still *uncertain*. There were two possible ways in which the team's result could have already been determined by the scores of the first two athletes. A team's loss was certain if the sum of the first two athletes' scores was 4 points or less. Because the maximum score that an athlete can achieve in the challenge is 10, it was impossible for the third athlete to make their team win. Likewise, a team's win was certain prior to the 3rd athlete's performance if the first two athletes' scores added up to 15 or more points.

Table 1. Patterns of non-identical athletes' scores used in the experiment.

R	**loss**						**win**					
C	**certain**			**uncertain**			**uncertain**			**certain**		
S	2	3	4	6	7	8	11	12	13	16	17	18
L	4	3	2	4	3	2	4	3	2	4	3	2
H	8	7	6	8	7	6	8	7	6	8	7	6

R = result, C = certainty of the team's result after the 2nd athlete's score, S = sum of the 1st and the 2nd athletes' scores, L = low score by the 3rd athlete, H = high score by the 3rd athlete.

A consequence of this design is that, while keeping the *absolute* performance of the 3rd athlete identical in the different situations the *relative* performance compared to his teammates varies. He performs relatively well in the *certain loss* as compared to the *uncertain loss* cases and relatively poorly in the *certain win* as compared to the *uncertain win* situations. Because our main interest concerns the effect of the (un-)certainty of outcome on the attributions for the 3rd athlete, we controlled for the effects of relative performance by including 8 additional cases in which the scores of all three athletes were identical. Here, all athletes either scored 2 (or 3 points) in the *certain loss* cases, 3 (or 4 points) in the *uncertain loss* cases, 6 (or 7 points) in the *uncertain win* cases and 8 (or 9 points) in the *certain win* cases. Any differences between the three athletes in these situations can only be explained in terms of order effects.

The main target of interest in our design is the 3rd athlete. We hypothesized that both her performance as well as the certainty of the team's result prior to her turn would affect participants' attributions. More precisely, we expected the 3rd athlete's blame for losses to be higher and credit for wins to be lower when she received a low as compared to a high score even in situations in which the results was already certain. Furthermore, we predicted that the 3rd athlete would receive less credit for an identical performance if the result was already certain as compared to still uncertain. Likewise, we predicted that the athlete would receive less blame for an identical performance if the team had already certainly missed the qualification threshold prior to her turn.

Method

Participants 41 (22 female) participants recruited through the UCL subject pool took part in the experiment. The mean age was 23.1 (*SD* = 2.5).

Materials The program was written in Adobe Flash CS5.

Design For the 24 patterns in which the scores of the three athletes were non-identical (see Table 1), the experiment followed a within-subject 2 (*result*: win vs. loss) x 2 (*certainty of outcome*: uncertain vs. certain) x 2 (*performance of the 3rd athlete*: low vs. high score) design. For the patterns with identical scores of the three athletes, the experiment followed a within-subject 2 (*result*) x 2 (*certainty of outcome*) design.

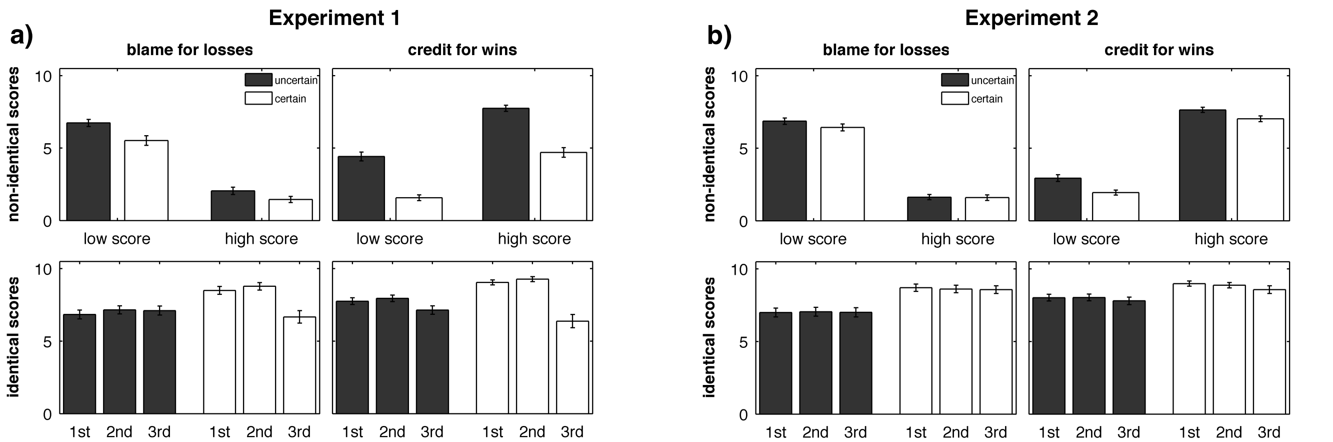

Figure 4. Mean blame and credit ratings of the 3rd athlete for cases with non-identical scores (top) and of all three athletes for cases with identical scores (bottom). Error bars indicate ±1 *SEM*.

Procedure The study was carried out online.[1] After having read the instructions, participants did one practice trial in which the different components of the screen were explained. A set of 4 comprehension check questions ensured that participants had understood the task. On average, they answered 89% of the comprehension check questions correctly. After answering each of the questions, the correct solution was displayed. Participants then evaluated the performance of 32 teams in the *probability rating phase* (Figure 1) and the *attribution phase* (Figure 2) as described above. If a team did not qualify, participants attributed blame otherwise they attributed credit. Throughout the game, they could remind themselves of the rules by clicking on the 'Rules' button in the bottom left of the screen (see Figures 1 and 2). The median time that it took participants to finish the study was 18.8 minutes.

Results

For all our analyses we adopted a significance criterion of .05 (two-sided) and applied Bonferroni corrections when multiple test were conducted on the same data set.

Probability updating phase Figure 3 (left panel) shows the mean probability of success ratings for wins and losses separated for situations in which the outcome was already certain after the 2nd athlete's score or still uncertain. For losses, participants' probability of success ratings after the 2nd athlete's score was revealed were significantly lower in the certain (M = 4.5, SD = 11.5) compared to the uncertain cases (M = 27.1, SD = 18.1), $t(40)$ = -15.71. For wins, participant's probability ratings were significantly higher in certain (M = 96.4, SD = 10.4) compared to the uncertain cases (M = 75.8, SD = 15.1), $t(40)$ = 14.46.

Responsibility attribution phase First, we wanted to test to what extent the blame and credit ratings for the 3rd athlete varied as a function of his performance and whether the team's result was already certain after the 2nd athlete's score or not. Two separate 2 (*certainty*: certain vs. uncertain) x 2 (*performance*: low vs. high score) repeated measures ANOVAs for losses and wins were conducted on the ratings for the 3rd athlete in the non-identical cases (see Figure 4a top).

For losses, there were significant main effects of *performance* $F(1,40)$ = 129.33, η = .764 and of *certainty* $F(1,40)$ = 6.86, η = .146 but no interaction. The 3rd athlete was blamed more if he received a low score compared to a high score. Furthermore, his blame ratings were lower when the team had already certainly missed the qualification criterion compared to when the outcome was still uncertain. Crucially, the effect of performance significantly influenced the athlete's blame ratings both for situations in which the outcome was still uncertain ($t(40)$ = 11.37) as well as when it was already determined ($t(40)$ = 8.36).

For wins, there were significant main effects of *performance* $F(1,40)$ = 66.03, η = .623 and of *certainty* $F(1,40)$ = 31.76, η = .443 but no interaction effect. The 3rd athlete received more credit for a high score compared to a low score. Also, credit attributions were higher if the result was still uncertain compared to certain. Again, the effect of

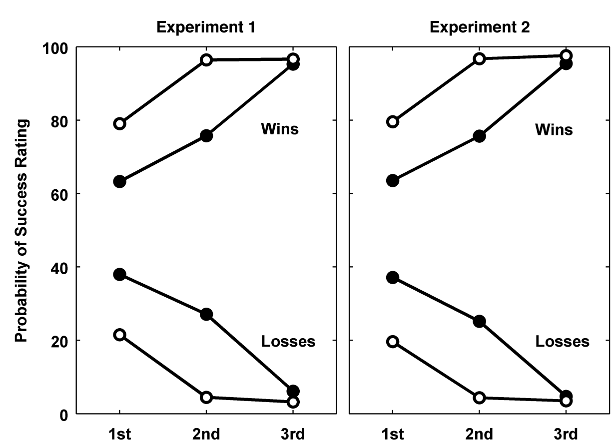

Figure 3. Mean probability of success ratings after each athlete's score was revealed. Black markers = uncertain cases, white markers = certain cases.

[1] The experiment can be accessed here: http://www.ucl.ac.uk/lagnado-lab/research.html

performance significantly influenced the athlete's credit ratings both for situations in which the outcome was still uncertain ($t(40) = -7.76$) as well as when it was already determined ($t(40) = -6.84$).

As outlined above, the predicted order effect and the relative performance effect go in the same direction for the cases in which the scores of the three athletes were non-identical. Hence, we analyzed the situations separately in which all of the athletes had identical scores. Any differences for these cases can only be explained with respect to the order of performance.

Figure 4a (bottom) shows the mean blame ratings for losses and credit ratings for wins attributed to all three athletes in the team in situations in which the result was uncertain and certain. To evaluate whether the 3rd athlete's ratings varied as a function of certainty of outcome, we compared the difference in the average attributions of the first two athletes with the 3rd athlete. For losses, this difference was significantly greater in the certain cases ($M = -1.97$, $SD = 3.77$) as opposed to the uncertain cases ($M = 0.11$, $SD = 1.81$). The 3rd athlete received significantly less blame for an identical performance if the result was already certain as compared to uncertain, $t(40) = -3.88$. For wins, likewise, the 3rd athlete received significantly less credit for an identical performance if the result was already certain ($M = -2.79$, $SD = 4.18$) as compared to uncertain ($M = -0.71$, $SD = 2.16$), $t(40) = -3.29$.

Discussion

The results of Experiment 1 show that how much blame or credit an athlete receives for his team's loss or win depends to a large extent on her performance. Even when the result of the team challenge is already determined, an athlete still receives more credit and less blame for a good performance compared to a bad performance. This finding is at odds with the CCM, since the performance of the player does not influence the probability of the team's outcome in these situations as revealed by participants' subjective probability ratings. However, participants did show an *attenuation effect* to the extent that the blame and credit attributions to the last athlete were reduced when the result was certain compared to uncertain.

Experiment 2

In Experiment 2 we wanted to see whether the reduction in blame and credit attributions for the situations in which the outcome was already determined overgeneralizes to situations in which it would be inappropriate. Crucially, whether the performance of the 3rd athlete *should* be discredited given that the outcome is already certain depends on that athlete's knowledge that this is the case. While keeping the experienced order of events unchanged, Experiment 2 altered the objective order of events and, alongside, the knowledge states of the athletes, by having the individual athletes perform *simultaneously* without knowing how the other team members perform. Spellman (1997) has shown that both the order in which events occur in the world as well as the order in which people learn about them can influence people's attributions. Experiment 2 aimed to investigate this further. Would participants show reduced blame attributions for losses and credit attributions for wins when they knew that the result was already determined? Or would they appreciate that the athletes did not know each other's scores and hence show no attenuation effect as a function of the certainty of the result?

Method

Participants 56 (42 female) participants recruited through the UCL subject pool took part in the experiment. The mean age was 21.4 ($SD = 4.6$).

Procedure The procedure was identical to Experiment 1 except for a minimal change in the instructions. Participants were informed that the athletes of each team were performing their individual routines *simultaneously* at different stadiums. Importantly, the athletes did not know how their teammates were doing. Participants were told that due to technical issues, they would see the scores of the three athletes sequentially. On average, participants answered 89% of the comprehension questions correctly. The median time it took participants to complete the study was 16.5 minutes.

Results

Probability updating phase Figure 3 (right panel) shows the probability of success ratings for Experiment 2. Again, participants were more confident about the team's loss after the 2nd athlete's score was revealed in the certain ($M = 4.3$, $SD = 10.3$) compared to the uncertain condition ($M = 25.2$, $SD = 15.8$), $t(55) = -17.77$. Also for wins, participants gave significantly higher ratings in the certain ($M = 96.7$, $SD = 10.5$) than in the uncertain condition ($M = 75.7$, $SD = 14.8$), $t(55) = 20.53$.

Responsibility attribution phase Again, the blame and credit ratings for the 3rd athlete varied with how he performed and, although much less so, with whether the result was already certain or not. Figure 4b (top) shows the blame and credit attributions of the 3rd athlete for the situations in which the scores of the three athletes were non-identical. For losses, there were significant main effects of performance $F(1,55) = 261.55$, $\eta = .826$ and of certainty $F(1,55) = 6.97$, $\eta = .112$ but no interaction effect. For wins, there were significant main effects of performance $F(1,55) = 363.55$, $\eta = .869$ and of certainty $F(1,55) = 14.04$, $\eta = .203$ but no interaction effect.

Importantly, the difference between the blame attributions in the certain cases and the uncertain cases was significantly larger in Experiment 1 ($M = -0.91$, $SD = 2.23$) compared to Experiment 2 ($M = -0.25$, $SD = .71$), $t(95) = -2.07$. Likewise, the differences between the credit attributions as a function of outcome certainty were larger in Experiment 1 ($M = -2.95$, $SD = 3.35$) than in Experiment 2 ($M = -0.73$, $SD = 1.45$), $t(95) = -4.44$.

Figure 4b (bottom) shows the blame and credit ratings of all three athletes for the situations in which their scores were identical. There was no significant difference between the mean blame ratings of the first two athletes and the 3rd athlete in the certain cases (*M* = -0.05, *SD* = 0.57) and the uncertain cases (*M* = 0, *SD* = 0.95). Furthermore, there was no significant difference for the credit ratings between the certain (*M* = -0.35, *SD* = 1.57) and the uncertain cases (*M* = -0.25, *SD* = 1.08).

Discussion

Similar to Experiment 1, blame and credit ratings varied depending on how the athletes performed. However, in contrast to the results of Experiment 1, the certainty factor had only a small influence on participants' responsibility attributions for the 3rd athlete in the non-identical cases and no influence in the identical cases. As mentioned above, the small effect of the certainty factor is likely to be a result of the differences in relative performance in the non-identical cases. Most of the participants were not influenced by the experienced order of events and took into account the fact that the 3rd athlete did not know her teammates' scores. Hence, the quality of the 3rd athlete's performance was not discredited in situations in which the outcome was already determined.

General Discussion

The results of two experiments show that people exhibit a rational attenuation effect in their responsibility attributions for team-members contributing sequentially to a team challenge. The quality of a team-member's performance is discredited for situations in which the outcome is already determined. Importantly, this effect is only present in situations in which the later team-member knows the previous members' scores. It does not overgeneralize to situations in which the order with which participants learn about the scores does not map onto the order in which they are generated: it seems to be the inferred epistemic state of the athletes that drives the attenuation effect. However, as the differences in epistemic states of the players between Experiment 1 and 2 were confounded with different objective orders of events, future research is needed that decouples these factors. In addition, it would be interesting to contrast the present situation to one in which physical events unfold over time.

Participants showed neither a primacy nor a recency effect in situations in which the team's outcome was still uncertain (see Figure 4 bottom panels). Only when athletes knew their teammates' scores (Experiment 1) were the blame and credit ratings for the 3rd athlete reduced when the outcome was already certain.

Spellman's (1997) CCM cannot account for the performance effect in situations in which the result is already determined. However, we consider this effect to be rational since the quality of performance of the 3rd athlete still conveys important information. For example, if an athlete performed well despite the fact that the team had already lost for sure we learn that he is in principle capable of a good performance. The athlete's good performance *could* have made a difference, in the counterfactual situation in which his teammates had performed somewhat better. In contrast, if the 3rd athlete performed poorly, we cannot be sure whether this is only due to the fact that he knows that the team has already lost and hence does not try hard, or whether he might not have performed better even if his contribution would have been needed. This difference in the information we receive makes it rational to take into account an athlete's performance even if the result was already determined.

Our experiments highlight the fact that a comprehensive model of responsibility attribution in group contexts will need to take into account the mental states of the players (Gerstenberg, Lagnado & Kareev, 2010), the extent to which each player made a difference to the outcome (Gerstenberg & Lagnado, 2010) as well as the quality of individual performance.

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