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ORIGINAL PAPER

When unfair treatment helps performance

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Abstract Human beings are responsive to fairness violations. People reject unfair offers and go out of their way to punish those who behave unfairly. However, little is known regarding when unfair treatment can either help or harm performance. We found that basketball players were more likely to make free throws after being awarded a foul specific to unfair treatment (Study 1). Similarly, hockey players were more likely to score during a penalty shot compared to a shootout (Study 2). A laboratory experiment showed that participants were more accurate at golf putting after a previous attempt had been unfairly nullified (Study 3). However, a final experiment revealed that when the task was more demanding, unfair treatment resulted in worse performance (Study 4). Moreover, this effect was mediated by feelings of anger and frustration. These results suggest that performance is sensitive to perceptions of fairness and justice.

Keywords Fairness · Performance · Basketball · Hockey · Golf · Sports

Introduction

People are in general very sensitive and averse to unfair treatment (Tyler and Blader 2003; Norton and Ariely 2011). One of the first complaints an American child expresses to his or her parents is, "that's unfair!" Indeed, 3-year olds are already capable of recognizing an unfair distribution of rewards (LoBue et al. 2011). Likewise, American adults were less happy in years of greater income inequality than in years of relative income equality due in part to greater feelings of unfairness (Oishi et al. 2011). Across many cultures, people go out of their way to punish those whose actions they deem unfair (Henrich et al. 2006). Likewise, people will frequently forego a (unearned) higher payoff for themselves in favor of a distribution that allocates resources equally (e.g., Johansson and Svedsäter 2009). In fact, this concern for fair treatment may even cross species, as capuchin monkeys are unwilling to continue participating in a task when receiving a less-valued reward than other monkeys performing the same task (Brosnan and de Waal 2003).

Here, adults, infants, and monkeys are reacting to situations where there is a mismatch between what is received and what is believed to be deserved. In this paper, fair and unfair are primarily determined by whether people believe they deserve what they received. In fair situations, there is a match between what an individual receives and what she believes to have deserved. In unfair situations, there is a mismatch between what an individual receives and what she believes to have deserved (specifically, this paper examines what happens when an individual receives *less* than what she believes to have deserved).

Previous research has shown that even subtly unfair treatment can lower positive and heighten negative emotion, and can lead to less cooperation. For instance, people who exhibited lower perceptions of procedural justice at work (e.g., the belief that workplace procedures are applied consistently to all employees) also had lower levels of citizenship behavior in their job, meaning they were less willing to go beyond job requirements and look towards benefitting others over the individual (De Cremer and Van Hiel 2006). Similar results were obtained in an experimental context

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where participants were asked to negotiate with a fair or unfair work partner. Again, unfair treatment resulted in less willingness to cooperate. Conversely, in another study, higher perceptions of fair treatment were positively related to greater organizational commitment (Bianchi and Brockner 2012). Being the recipient of unfair treatment thus appears to have the toxic effect of lowering positive mood and reducing commitment towards others.

However, there remains little research on the effect of unfairness on skilled performance, as opposed to general emotion or motivation. It is possible that if an unfair situation is permanent (e.g., the caste system), unfair treatment will give rise to learned helplessness and towards system justification (Jost and Banaji 1994), two processes that should decrease performance (Crocker et al. 1998). But what about when the unfair situation is only temporary? A fascinating study found that National Basketball Association (NBA) players miss more free throws right after an undeserving foul call, presumably due to a sense of guilt from not having properly earned their reward (Haynes and Gilovich 2010). However, this study did not examine what happens to performance when players were unfairly treated, rather than the underserving beneficiaries of an unfair foul call. Would the victims' performance increase? We conducted four studies to investigate this question.

Theoretical background

Equity theory (Adams 1963; Mowday 1991) posits that perceived fairness can predict performance. Specifically, perceived fairness should give rise to better performance, whereas perceived unfairness should give rise to poor performance, in part because fairness promotes commitment and effort whereas unfairness reduces commitment and effort. Indeed, perceived fairness increases task performance and satisfaction while reducing errors (e.g., Alder and Ambrose 2005). However, in previous research, the influence of fairness on performance is not large. For instance, meta-analyses found small (average correlation of .15, Cohen-Charash and Spector 2001) to moderate correlations ($r = .10$–$.36$ for procedural fairness and .13 for informational fairness in Colquitt et al. 2001) between fairness and job performance.

These findings suggest that there are important moderators to the link between perceived fairness and performance. That is, under normal circumstances, perceived fairness should be positively associated with performance, but under other circumstances, perceived fairness should not be associated with superior performance. Indeed, Collins et al. (2012) found that fairness was positively associated with performance among workers who intended to stay in the current organization. In contrast, however, perceived fairness was negatively associated with performance among workers who did not intend to stay. Likewise, Janssen (2001) found that workers performed better when they perceived their situation to be fair than when they perceived their situation to be unfair, as long as their workload was moderately demanding. However, workers performed better when they perceived their situation to be *unfair* than when they perceived their situation to be fair, if their workload was very undemanding. That is, when the task was easy and undemanding, workers tended to perform better under unfair conditions.

However, it is currently unclear why perceived unfairness should be associated with any positive performance when the task is not very demanding and when people have no intention of leaving their current situation. In the present article we propose that these findings could be explained in part by emotions produced by perceived unfairness. For instance, perceived unfairness can result in many outcomes, one of which is increased anger. Specifically, anger is the emotion that arises when one perceives "the violation of standards and the thwarting of goals" (Ortony et al. 1988, p. 153). It directs one's attention narrowly to the source of the problem, and arouses various physiological reactions. There is already a large body of literature on the positive function of anger (e.g., Averill 1982; Tavris 1989; Wilkowski and Meier 2010). For instance, anger has been previously linked to power; in one study, participants assigned a higher status and larger salary to a candidate expressing anger as opposed to sadness (Tiedens 2001). Aside from such perceptual benefits, separate work has highlighted the positive consequences of feeling anger. Angry participants have been shown to display higher task persistence (Lench and Levine 2008) and heightened attention to rewards (Ford et al. 2010, 2012). Anger is considered an approach emotion, one that increases the pursuit of desired incentives and goals (Carver and Harmon-Jones 2009; Gable et al. 2015). Moreover, anger can lead to a greater sense of control and a reduced sense of uncertainty (Lerner and Keltner 2001). Such a sense of control might translate into a feeling of personal agency and efficacy, which could in turn result in better task performance following unfair treatment.

It is not immediately clear how the control theory of anger can serve as one explanation for why perceived unfairness is associated with better performance among people who are not intending to stay in their current situation (Collins et al. 2012) or those whose work loads are not demanding (Janssen 2001). We believe that a better explanation is arousal. Just as arousal helps individuals perform a simple task better (Zajonc et al. 1969), when the task is undemanding, anger might help individuals perform a (relatively) simple task well, as anger may help accelerate the task whose course of action is well-practiced or straightforward. When the task at hand is demanding (namely, one that involves complex features), however, anger could impede performance because individuals must pay careful attention to various aspects of the task.

The present studies

Although there is a large literature on fairness, most research on fairness and performance has focused on organizational fairness and job performance: the procedural and outcome fairness of the organization, and its effects on workers' job performance. That is, previous research has focused on fairness in terms of chronic aspects of one's environment. However, fairness comes into play in everyday actions as well. For instance, workers experience a sense of unfairness or fairness when a supervisor makes a specific comment about their current work. Thus, it is important to examine the role of unfairness in a concrete task and across new contexts. In most sports, fair and unfair plays are clearly delineated. In the National Basketball Association (NBA), for instance, players who committed an unfair play will receive a foul. An unfair play on the player who was trying to make a shot will result in two free throws. However, a special case of an unfair play is a clear path foul, which is awarded when a defender unfairly obstructs an easy scoring opportunity. Anger and frustrations are likely to be felt when the player had a clear path to the basket but this prized scoring opportunity was prevented by an unfair play. Because a clear path foul results in two free throws, task performance can also be accurately assessed.

Study 1 examined whether NBA players made free throws more accurately for clear path fouls (an unfair interruption) than for regular shooting fouls. Compared to other field goal attempts (NBA players' average field goal percentage is around 45 %), free throws are easy, undemanding tasks for most players (NBA players' average free throw shooting is around 70 %). Thus, based on Jannsen's (2001) finding, we hypothesized that an unfair interruption (here, a clear path foul) would result in better performance (more free throws made). Similarly, in Study 2, we analyzed National Hockey League's (NHL) penalty shots because penalty shots are given in a similar situation to clear path fouls. That is, the offensive player is in a position to score more easily, but the opposing player unfairly stops the offensive player. Since penalty shots are much easier than shots that occur during normal play, we hypothesized that NHL players would perform better in penalty shots, which follow unfair treatment, than shots during a shootout, which have the same setup as penalty shots but do not follow an unfair interruption.

Although Studies 1 and 2 provide clear cases of unfair plays and their consequences on task performance, the data come from professional athletes' performance, which limits generalizability. Furthermore, these are correlational studies. Thus, we conducted an experiment (Study 3) to establish a causal link between unfair treatment and heightened performance when task demands are low. Specifically, participants played a golf putting task. Half of the participants' more promising putts were unfairly interrupted. We then measured subsequent putting performance. As putting was an enjoyable task that was low in demand, we predicted that, like NBA's clear path foul shots and NHL's penalty shots, participants in the unfair interruption condition would perform better than those in the control condition (with no unfair interruption).

The first three studies tested the effect of unfairness on performance for relatively easy or prized tasks. We expected that unfairness would result in better performance in the first these studies because unfair interruptions are expected to generate anger, which may in turn facilitate performance on well-practiced or relatively low-demand tasks. We conducted Study 4 to test another facet of our theoretical predictions, namely that unfairness will generate anger, which will impede performance on a highly demanding task. Specifically, in Study 4, participants completed an increasingly difficult n-back task, in which they are asked to remember the number presented *n* trials before the last one. Half of the participants' performance was unfairly interrupted, and subsequent n-back performance was assessed. In sum, in four studies we tested our theoretical predictions that unfair interruptions will result in increased performance when the task is relatively easy, whereas it will result in detrimental performance when the task is demanding, and that one mediating factor for the role of unfair treatment on performance is increased anger (measured in Study 4).

In Study 1, we tested whether NBA players would be more likely to make a free-throw following a clear path foul.

Study 1

Study 1 examined whether NBA players who had been unfairly denied an opportunity to score would perform better on ensuing free throws, compared to free throw performance following other fouls. In the NBA, players are awarded free throws for numerous reasons, usually after the defensive player makes illegal contact with the offensive player while shooting. However, some fouls are deemed more egregious than others. Specifically, clear path fouls are given when "a defender fouls any offensive player when the team is going to score an easy basket" (NBA.com). In a typical clear path foul, a player will steal the ball from his opponent, resulting in an open, unobstructed path to the basket for an easy, undefended scoring opportunity. At this point, a defender will catch up to the player with the ball and grab them from behind, thereby removing the chance at scoring easily. Unlike other fouls, clear path fouls imply that the offensive player would have easily made the original shot if not for the violation.

Materials and procedure

All regular-season NBA free throw attempts from four seasons (2005–2009) were collected. Number of seasons was selected arbitrarily until we felt we had a large enough sample of free throws. Analyses were based on 240,866 free throws (Level 1) from 639 players (Level 2). In all, 637 free throws (.26 %) occurred after clear path fouls. Data from all studies can be downloaded at: https://osf.io/bkzbz/.

After clear path fouls, players shoot free throws alone, with other players behind half-court. Players also shoot alone after technical and flagrant fouls. To control for any benefit of shooting alone, attempts were coded both for shooting alone and for following clear path fouls.

Results

We employed hierarchical linear modeling (HLM) to assess whether free throws from clear path fouls had a higher likelihood of being made than other types of free throws. The model consisted of two levels. In Level 1 (within-individual), free throw outcomes were predicted by an intercept, whether the player shot alone, whether the player shot after a clear path foul, and an error term. The intercept indicates each player's regular free throw accuracy (i.e., free throws *not* following clear path, technical, or flagrant fouls), and the coefficients for the two predictors indicate whether each player's free throw accuracy was greater than the regular free throw when they were shooting a free throw after a technical or flagrant foul (the first predictor), or when they were shooting a free throw after a clear path foul (the second predictor). In Level 2 (between-individual), Level 1 predictors and an intercept were predicted by the player's free throw accuracy over the four seasons (standardized). Because the outcome was binary, we used a Bernoulli model.

Unsurprisingly, higher free-throw accuracy predicted a higher likelihood of making a regular free throw, $\beta = .75$, $t(637) = 71.84$, S.E. = .01, $p < .001$, OR 2.11. As predicted, players were more likely to make free throws after clear path fouls than regular free throws, $\beta = .32$, $t(240{,}860) = 2.77$, S.E. = .11, $p = .006$, OR 1.37. This effect was moderated by a player's free-throw accuracy, $\beta = -.36$, $t(240{,}860) = -2.22$, S.E. = .16, $p = .026$, OR .70, as the worst free throw shooters showed the largest increase in accuracy following clear path fouls (see Fig. 1).

In contrast, players were in general less likely to make free throws when shooting by themselves after technical or flagrant fouls than the regular fouls, $\beta = -.11$, $t(240{,}860) = -2.26$, S.E. = .05, $p = .024$, OR .89. This effect was not moderated by players' four-season free throw accuracy, $\beta = -.02$, $t(240{,}860) = -.34$, S.E. = .06, $p = .733$, and suggests that the benefit in accuracy following clear path fouls exists in spite of a general decrease in free throw performance when players have to shoot alone.

Discussion

Study 1 provides evidence that free throw performance is sensitive to the competitive context. For the well-practiced and generally accurate task of shooting free throws, players were more accurate following clear path fouls than other fouls. In contrast, although technical and flagrant foul shots shared the same unfamiliar shooting context (shooting free throws alone), players were less accurate when attempting technical and flagrant foul shots than regular foul shots. Furthermore, the enhanced accuracy of a clear path foul shot was strongest for the worst free throw shooters. These results suggest that such players may have felt even more unfairly thwarted (and angrier), as these were the players least likely to regain their lost points at the free throw line. However, this moderation is difficult to interpret given a possible ceiling effect among the better free throw shooters.

While the results of Study 1 are suggestive, it is unclear whether the observed performance boost is limited to this sample and context. Study 2 sought to replicate this effect in a different sport that still maintains a similar performance situation. Like basketball, hockey issues a penalty when players are deprived of a relatively easier opportunity to score. Study 2 then investigated whether NHL players would be more likely to score in such cases. In Study 2, we tested whether NHL players would be more likely to make a penalty shot than a shot during a shootout.

Study 2

In the NHL, there are two instances wherein players have a one-on-one opportunity to score on the goalie. The first is a penalty shot. Penalty shots are awarded after a player has only the goalkeeper to beat, but is interfered with by an

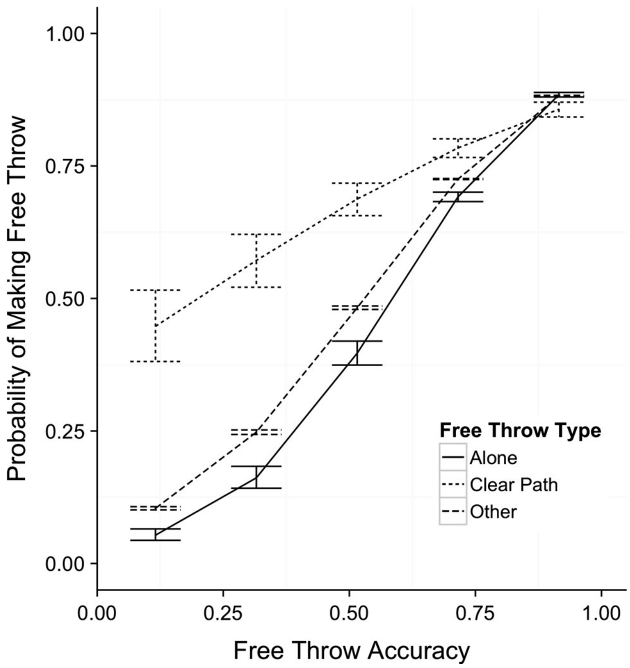

Fig. 1 Probability of making a free throw when shooting free throws alone, after a clear path foul, or under any other circumstances as a function of 4-year player free throw accuracy. *Error bars* represent standard errors at various intervals of player free throw accuracy

"object or piece of equipment thrown or shot by any member of the defending team" (NHL.com). Like clear path fouls, penalty shots imply that the player, if not for the defense's illegal interference, had a comparatively high probability of scoring. The second instance occurs during a shootout, when teams attempt to end a tie game following an overtime period.[1]

Across both penalty shots and shootouts, hockey allows for two instances where players have a one-on-one opportunity to score against the goalie. Both penalty shots and shootout attempts are considered easier scoring opportunities relative to normal play. In the seven seasons we analyzed, 33 % of penalty shots and shootout attempts resulted in a goal, compared to 9 % of shots taken during normal play. However, only penalty shots occur after a player has been wrongly denied a high-percentage scoring opportunity. To test the effect of clear path fouls in Study 1, Study 2 investigated whether NHL players would be more likely to score in a penalty shot than a shootout.

Materials and procedure

All regular-season NHL penalty shot and shootout attempts from seven seasons (2005–2012) were collected. Since penalty shots and shootouts occur much less frequently than free throws, we collected as much data as we could find, starting when analyses occurred in May 2012. Analyses were based on 8467 shots (Level 1) from 702 players (Level 2). Of the 8467 attempts, 488 were penalty shots (5.76 %).

Unlike free throws, shootout and penalty shot attempts vary in difficulty, as players compete against goalies with differing skill levels. As a result, we included the 7-year average goals allowed per game by each goalie to control for shot difficulty.

Results

As in Study 1, we used the Bernoulli model of HLM to assess whether players were more likely to score in a penalty shot than a shootout. In Level 1, a scored goal was predicted by an intercept, whether the player was shooting a penalty shot or in a shootout (penalty shot = 1; shootout shot = 0), the average goals allowed by the goalie, and an error term. In this model, the intercept indicates each player's probability of making a goal in a shootout against the goalie whose average goals allowed was the league average. The coefficient for the first predictor indicates whether the penalty shot was made more accurately than the shootout attempt, controlling for the opposing goalie's skills, while the coefficient for the second predictor indicates whether the goalie's average performance made a difference in the probability of a player making a shootout shot. In Level 2, the player's average goals per game over the seven seasons (standardized) were used to predict the likelihood of scoring a shootout goal (intercept) and the penalty shot at Level 1.

As expected, players who scored more goals per game were more likely to score in these one-on-one situations, $\beta = .05$, $t(700) = 2.15$, S.E. = .02, $p = .032$, OR 1.05. Similarly, attempts on goalies allowing more goals per game were more likely to result in a goal, $\beta = .09$, $t(8461) = 2.85$, S.E. = .03, $p = .005$, OR 1.09. Importantly, and in replication of Study 1, players were more likely to score during penalty shots than shootouts, $\beta = .53$, $t(8461) = 3.75$, S.E. = .14, $p < .001$, OR 1.69. Again, as in Study 1, this effect was marginally moderated by goals scored per game, $\beta = -.15$, $t(8461) = -1.74$, S.E. = .09, $p = .082$, OR .86. That is, players averaging fewer goals per game showed the highest performance boost during penalty shots (see Fig. 2).

[1] In an NHL shootout, each team names three shooters. The teams then alternate shooters, who attempt to score one-on-one with the goalie. After three rounds, the team with more goals in the shootout wins. If the game remains tied after the three shooters have finished, teams continue shooting in "sudden death" mode.

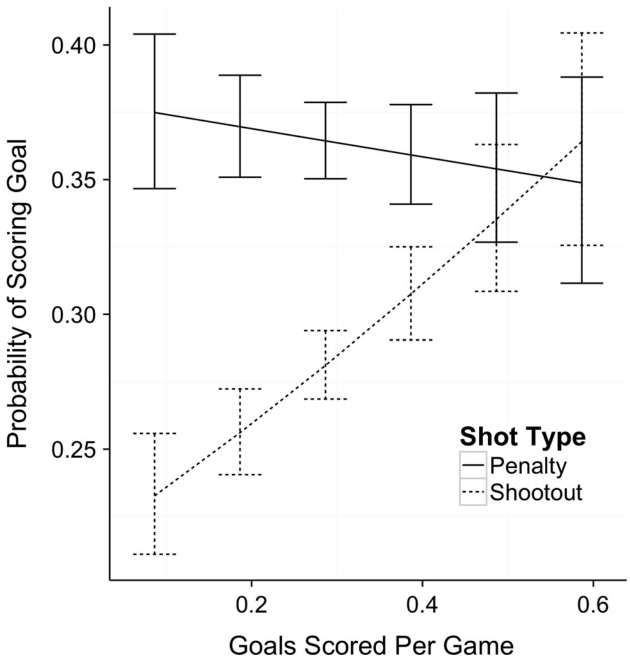

Fig. 2 Probability of scoring a goal when attempted during either a penalty shot or a shootout as a function of player average goals per game. *Error bars* represent standard errors at various intervals of player average goals per game

Discussion

Study 2 conceptually replicates the effects in Study 1. On a task that was significantly easier than opportunities to score during normal play, players were more likely to succeed following a violation that suggested unfair treatment. As in Study 1, this effect was more pronounced for players who were generally less likely to score during normal play. Whereas this moderation by skill level may have been created by a ceiling effect amongst the most highly skilled free throw shooters in Study 1, a comparable ceiling effect is a less likely explanation for the interaction observed in Study 2. Even the players with the highest goals per game average still had relatively low probabilities of scoring in a one-on-one situation with the goalie (only around 35 % among players who scored the most goals per game), meaning that there was still significant room for improvement among highly skilled players. Figure 2 indicates that players with the lowest likelihood of scoring during normal gameplay performed in penalty shots at levels similar to their more skilled counterparts. In light of the possible ceiling effect in Study 1, Study 2 data suggest that this boost in performance may be particularly pronounced for those players least likely to score in other situations, as such players are most adversely affected by the unfair treatment (and perhaps made most angry as well). That said, while there is certainly room for improvement in probability of scoring a goal, it is possible that Study 2 also suffers from a ceiling effect (e.g., just as 38 % may be an upper limit of hitting percentage for Major League Baseball players, so too may 35 % be an upper limit on penalty/shootout scoring among NHL players).

However, there are two plausible alternative explanations for the higher likelihood of scoring a goal in a penalty shot than a shootout observed in Study 2. For one, shootouts occur at the end of tie games, so players may be under more pressure to score, resulting in “choking” behavior that creates worse performance. In addition, shootouts last for a minimum of three rounds, perhaps allowing goalies to become more practiced at stopping opponents’ shots. This extra practice may similarly create a lower probability of scoring a goal during a shootout.

To address these two possible explanations, we analyzed shootout attempts to see if players were more or less likely to score after each additional round. For, if the results of Study 2 were driven by greater shooter pressure or goalie practice, players should be less likely to score the further into a shootout, as goalies becomes more practiced and each attempt brings higher pressure and more importance for the outcome of the game. The 7979 shootout attempts in the dataset were analyzed, again including the 7-year average goals allowed per game by each goalie, the overall goals scored per game by each player, while now adding the round in the shootout when the shot was taken (unstandardized).

As expected, players who scored more goals per game were again more likely to score in shootouts, $\beta = .05$, $t(664) = 2.10$, S.E. = .02, $p = .036$, OR 1.05. Similarly, attempts on goalies allowing more goals per game were more likely to result in a goal, $\beta = .09$, $t(7973) = 2.90$, S.E. = .03, $p = .004$, OR 1.10. Most importantly, attempts made later in the shootout were *more* likely to result in goals, B = .05, $t(7973) = 5.65$, S.E. = .009, $p < .001$, OR 1.05. Thus, there was no support for these alternative explanations of our main findings.

These results suggest that players had a higher likelihood to score after each round in a shootout, indicating that goalies were not benefitting from the extra practice and players were unaffected by the increased pressure that occurs as a shootout progresses.[2] The results of Study 2 then appear to be due to the unfair treatment preceding a penalty shot, rather than higher pressure or more practiced goalies in a shootout.

[2] Another possible explanation for these results is fatigue. Shooters may perform worse in shootouts because these attempts come at the end of a game and players are more tired. However, fatigue would affect goalies as well as players, so the effect of fatigue may influence players (making it harder to score) but also goalies (making it easier to score).

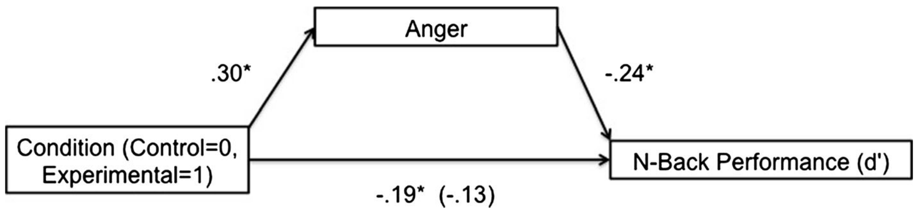

Fig. 3 Standardized regression coefficients for the relationship between experimental condition and task sensitivity as mediated by anger in "Study 4". The standardized regression coefficient between experimental condition and task sensitivity, controlling for anger, is in parentheses. * $p < .05$

Study 3

In two professional sports, we found that players' performance increased after their chance at scoring was unfairly obstructed. However, one major limitation of Studies 1 and 2 is their correlational nature. Although we have demonstrated the temporal sequence between unfair treatment and increased performance on a relatively easy or prized task, it is unclear whether unfair interference *caused* improved performance. To address this limitation, we conducted a laboratory experiment, manipulating unfair treatment. We sought to design a context similar to those faced by the athletes in Studies 1 and 2. To this end, we created a task where participants competed against a confederate in golf putting. For some participants, one shot was nullified by their competitor, and these participants were granted a "re-do" attempt.

We investigated whether this interruption, with the subsequent "re-do" shot, created more accurate putts. We believe that this putting task was comparable to the outcome measures in Studies 1 and 2. Although participants in Study 3 were not professional athletes, the putting task was designed to be straightforward for participants and not requiring overly sustained or demanding effort. As in the free throws or penalty shots, Study 3 used a "one shot" outcome measure that could be completed in a few seconds, unlike the more lasting and taxing outcome used in Study 4. In Study 3, we tested whether participants in the laboratory would show improved putting performance following an attempt that was unfairly nullified.

Participants

Fifty-six undergraduate students (14 Male, 42 Female, $M_{Age} = 18.8$ years, $SD = 1.8$) participated in exchange for partial course credit.

Procedure

Participants arrived at the study and were greeted by an opposite-gender experimenter. As participants provided consent, another participant arrived, which was actually a gender-matched confederate. The experimenter explained that the study would consist of a putting contest, and that the winner would receive a small prize (candy or a pen). Following two practice shots, players would alternate shooting at a metal target that was placed 12 feet away. The metal target was the size of a regulation golf hole (4.25 inches), and all putts took place in a carpeted room. After each attempt, it was the job of the non-shooting player to use a tape measure to record how far the shot was from the target and report that number to the experimenter, who then noted the score on a whiteboard. The competition lasted for eight rounds. The participant flipped a coin to see who would putt first.

Participants were randomly assigned to one of two conditions. In the *control* condition, the competition was completed without interruption. In the *experimental* condition, one participant's shot was nullified as a result of an "accident" committed by the confederate. Specifically, confederates were instructed to select a shot attempt (excluding the first and last) to nullify. This attempt was supposed to be one of the participant's better (but not best) attempts, so the participant would feel their goal of performing well was thwarted when the shot was later nullified.

When measuring the to-be-nullified shot, the confederate would pretend to have trouble opening the tape measure and hit the participant's ball. After the ball had been moved, the experimenter would insist that the player retake the shot instead of guessing where the ball originally landed. Before the participant took the next shot, the confederate would say, "Sorry, but that kind of helps me. That was a good shot" as a way of leaving it ambiguous whether or not the nullification was intentional. After this interruption, the competition finished following the normal rules.

Upon finishing the putting task, participants completed a survey packet consisting of demographic information, the number of rounds of golf they had played in the last month, how confident they felt in their putting ability, as well as several personality scales (Campbell et al. 2004; Rosenberg 1965; Schutz et al. 2004). Finally, participants were debriefed and given a prize, regardless of performance.

Results

We used HLM to assess whether players putted closer to the target after the unfair interruption. The model consisted of two levels. In Level 1, distance to the metal target in inches was predicted by whether or not the attempt followed a previously nullified shot. In Level 2, gender (Male = 1, Female = 0) and average number of golf rounds played over the last month (standardized) were used to predict distance from the target at Level 1. Since we only expected differential performance among those interrupted shots in the experimental condition, we used contrast coding (Rosenthal et al. 2000) as follows: all shot attempts in the control condition, as well as all uninterrupted attempts in the experimental condition = −1, all critical re-do shots in the experimental condition = +3.

As expected, participants who reported playing more rounds of golf in the past month had shots that were significantly closer to the target [$\beta = -3.92$, $t(53) = -2.34$, $p = .023$]. In addition, there was no evidence of performance differences across gender [$\beta = -2.77$, $t(53) = -.93$, $p = .356$]. Most importantly, shots following a nullification were significantly closer to the target [$\beta = -1.98$, $t(106) = -2.52$, $p = .013$, $d = .49$] than uninterrupted shots.[3] This effect was not qualified by gender [$\beta = .89$, $t(106) = .557$, $p = .578$] or previous golf experience [$\beta = -.48$, $t(106) = -.4$, $p = .69$].

Discussion

While Studies 1 and 2 were ultimately correlational, Study 3 was able to replicate the result of increased performance following unfair treatment, demonstrating the causal effect of an unfair interruption on performance for a relatively easy task that was low in demand. Attempts following an unfair nullification were seven inches closer to the target compared to shots taken during normal play. We were also able to show the same boost following unfair treatment on a different task (golf putting), a different outcome (distance from target instead of a made or missed shot), as well as in a different sample population (undergraduates instead of professional athletes).

Unlike Studies 1 and 2, Study 3 found no moderation with skill level. This may be due to the fact that participants in Study 3 were mostly novices or did not play golf at all, reporting an average of .72 rounds of golf played over the last month (and 84 % reporting 0 rounds played). Moderation by skill level may only arise at the upper levels of expertise, as seen in the professional athletes used in Studies 1 and 2.

Study 4

Study 4 investigated one possible boundary conditions of the influence of unfair treatment on task performance. Past research has already illuminated a number of moderators concerning the influence of unfairness on performance. For instance, the type of task being performed has been found to be a crucial factor in the role of unfair treatment (Janssen 2001). Here, when the task at hand was moderately easy, unfair treatment resulted in improved performance. However, when the central task was made to be more difficult, unfair treatment hurt performance.

Studies 1–3 have all centered on relatively well-rehearsed (for the professional athletes in Studies 1 and 2) or low-effort tasks (for the novice putters in Study 3). On average, NBA players make more than 70 % of their free-throw attempts, and attempt thousands of them throughout their careers. Likewise, penalty shots are made at a considerably higher rate than hockey shots that occur during normal play, and players routinely practice these one-on-one shot opportunities. Finally, the putts completed by laboratory participants in Study 3 were under little pressure, required little effort, and were straightforward (literally). For these reasons, we may expect unfair treatment to result in improved performance.

Study 4 then examined whether such unfair treatment would still increase performance following a substantially harder task. Specifically, Study 4 involved a taxing cognitive task and an experimental design that required participants to spend a considerable amount of time working their way through the task before they were allowed to complete the study and earn a potential prize. The task also required continual and sustained effort in order to succeed, unlike the more "one shot" outcomes used in Studies 1-3.

In one condition, participants received an unexpected and unfair setback during the study. Here, when the task is significantly more effortful, we would expect unfair treatment to have a debilitating influence on performance. Furthermore, we also sought to measure potential mediator variables of the effect of unfair treatment on task

[3] A model also coding for shot attempt number, to control for possible practice effects, yielded a moderately significant effect of shot interruption ($\beta = -1.69$, $t(439) = -1.75$, $p = .081$). We also ran a yoked analysis matched on gender, matching subsequent same-gender participants in the control and experimental conditions and comparing performance (in standardized inches from the target) on the critical shot number. Consistent with the original analysis, shots in the experimental condition had a shorter distance to the target ($M = -.37$, $SD = .76$) than shots in the control condition ($M = .13$, $SD = .89$), $t(27) = 2.26$, $p = .032$, $d = .43$. The data and analysis scripts for this yoked design are available at: https://osf.io/bkzbz/files/
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performance. Specifically, we measured negative emotional reactions that had high arousal, frustration and anger, as well as a negative emotion with low arousal, sadness, as potential mediators. If anger and frustration mediated the effect of unfair treatment on performance but sadness did not, we could be more confident that the arousal created by anger and frustration were most important for understanding the influence of unfairness on performance instead of general negativity.

One shortcoming of Study 3 was that the unfair interruption was designed to appear as a spontaneous accident. As a result, it would have been difficult to assess emotional reactions to the unfair treatment, since many participants would have become suspicious at having to report their emotions after this supposedly unplanned incident. Furthermore, asking participants to report their emotional reactions would have created even longer delays between unfair treatment and performance. For these reasons, we decided to not immediately assess participant reactions to the unfair interruption in Study 3. However, to address this concern as well as to better understand the emotional consequences of unfair treatment on task performance, we designed Study 4 such that we could measure participants' emotional reactions shortly following the unfair interruption. In Study 4, we tested whether participants in the laboratory would show worse working memory performance after their progress on the task was unfairly nullified.

Participants

One-hundred and sixteen undergraduate students (39 Male, 77 Female, $M_{Age} = 18.7$ years, $SD = 1.0$) participated in exchange for partial course credit.

Procedure

Participants arrived at the study, provided consent, and were directed by an experimenter to sit in an individual cubicle with its own computer. Participants then began reading the instructions for the n-back task. In an n-back task, participants are presented with a sequence of stimuli, and the task consists of indicating when the current stimulus matches the one from *n* steps earlier in the sequence. The load factor *n* can be adjusted to make the task more or less difficult, with higher *n* values indicating a more difficult task. In this version of the task, stimuli consisted of the digits 1–9, and participants were instructed to press a key any time a new stimulus appeared on screen, using the "a" key if the digit matched the digit presented *n* digits ago, and the "l" key if the digit did not match.

In this study, participants were told that if they achieved five blocks with 90 % or greater accuracy, they would then be eligible for a prize block. If they again achieved >90 % accuracy in this prize block, they would earn a prize. Participants were then given instructions for 1-back, 2-back and 3-back blocks, and completed practice 1-back, 2-back and 3-back blocks, receiving performance feedback at the end of each block. Following these practice blocks, participants were then told that the real test would begin. The test was described as adaptive. If participants had >90 % or greater accuracy on a block, the next block would increase the *n* by one. If participants had <75 % accuracy on a block, the next block would decrease the *n* by one. If accuracy was between 75 and 90 %, the *n* value for the next block would remain the same. Each block contained 20 trials with four trials where the target matched the stimuli presented *n* back. After each block, participants received accuracy feedback as well as information regarding how many blocks with 90 % or greater accuracy they had achieved.

Participants in the control condition ($N = 56$) worked on the test without interruption until they got to 5 blocks with 90 % or greater accuracy. Participants in the experimental condition ($N = 60$) received unfair treatment as they worked through the task. Specifically, once participants in the experimental condition received feedback that they had completed their fourth block of 90 % or greater accuracy, the computer screen went blank and did not progress. Participants notified the experimenter, who clicked around the screen a few times and remarked that the computer had apparently froze. The experimenter blamed the malfunction on the graduate student responsible for programming the task, who had not done a thorough job. Next, the experimenter explained that the only way to progress was to re-do the last block since the data were not recorded, but the only way to go forward would require increasing the *n* number by one. As a result, participants in the experimental condition had to complete a more difficult block in order to re-earn their fourth block of 90 % or greater accuracy, but this "re-do" block would be of equal difficulty to that of the participant in the control condition who had not received the unfair treatment and had continued on in the task. After the unfair treatment, participants worked on the task until they completed their fifth block of 90 % or greater accuracy.

Once participants reached five blocks of >90 % accuracy but before completing the final, prize block, participants completed a questionnaire. This questionnaire included items regarding various perceptions of the task as well as ratings for several emotions (all measured variables available at https://osf.io/bkzbz/).

Most importantly, the questionnaire included statements regarding the fairness of the task ("The scoring and setup of the task so far has been fair", "The competition to earn the prize so far has been fair") completed on a 7-point scale from *1 = Strongly Disagree* to *7 = Strongly Agree*, as well as a general rating of task fairness completed on a 7-point scale from *1 = Very Unfair* to *7 = Very Fair*. In addition, the questionnaire assessed the current levels of emotions such as frustration, anger and sadness, which were completed on a five-point scale of *1 = Not At All* to *5 = Very Much*. Finally, as a manipulation check, participants rated the difficulty of the task on a 7-point scale from *1 = Very Easy* to *7 = Very Difficult*. Note that participants still had one n-back block remaining in the study when they completed this questionnaire, and it was still undetermined if they would earn a prize.

Upon finishing this first questionnaire, participants completed the prize block for the n-back task. Afterwards, participants then filled out the same demographic and personality questionnaires completed at the end of Study 3. Participants were then debriefed and given a prize, regardless of performance.

Results

Degrees of freedom vary due to missing questionnaire data from participants who failed to respond to certain questionnaire items.

Difficulty perceptions

On average, participants rated the task as being difficult (M = 5.15, SD = .96). Ratings of task difficulty did not differ between experimental conditions, t(114) = .811, $p = .419$, $d = .16$.

Fairness perceptions

Perceptions of whether the task was fair, whether the scoring was fair and whether the competition was fair were averaged (all r's > .59) to create an overall fairness index. Participants in the control condition believed that the task was fairer (M = 5.77, SD = 1.0) than participants in the experimental condition (M = 5.30, SD = 1.18), t(112) = 2.29, $p = .024$, $d = .43$.

Emotional reactions

Participants in the experimental condition felt more frustrated (M = 2.82, SD = 1.23) than the control condition (M = 2.26, SD = .98), t(114) = 2.69, $p = .008$, $d = .50$. In addition, participants in the experimental condition felt less relaxed (M = 2.27, SD = 1.13) than the control condition (M = 2.68, SD = 1.05), t(114) = 2.03, $p = .045$, $d = .38$. Participants in the experimental condition felt angrier (M = 1.93, SD = 1.15) than the control condition (M = 1.36, SD = .62), $t_{Satterthwaite}(91.65) = 3.40$, $p = .001$, $d = .62$. Finally, there were no reliable differences between the experimental condition (M = 1.32, SD = .70) and control condition (M = 1.21, SD = .53) in reported sadness, $t(114) = .88$, $p = .379$, $d = .18$.

Task performance

For the most relevant comparison of performance, we compared accuracy on the block immediately following the unfair interruption in the experimental condition to the comparable block in the control condition, which meant the block following the fourth block of 90 % or greater accuracy.

Participants in the control condition had higher accuracy on the critical block (M = .83, SD = .10) than participants in the experimental condition (M = .79, SD = .13), $t(114) = 2.10$, $p = .038$, $d = .39$. Our primary dependent variable was task sensitivity (d′), which is a measure of hits relative to false alarms (Haatveit et al. 2010). For task sensitivity (d′) in the critical block, participants in the control condition also had better performance (M = 1.85, SD = .81) than participants in the experimental condition (M = 1.51, SD = .83), $t(114) = 2.08$, $p = .040$, $d = .39$.

Next, in order to control for the difficulty of the N-Back block, we conducted a linear regression analysis predicting task sensitivity (d′) from condition (Experimental = 1, Control = 0) and the n-back value for the critical block. As expected, task sensitivity decreased with higher n-back values, $\beta = -.27$, $t = -3.04$, $p = .003$. Controlling for task difficulty (n-back values), the effect of experimental condition remained significant, $\beta = -.18$, $t = -2.07$, $p = .041$.

Mediation analyses

Finally, we tested whether the negative effect of unfair interruption on task performance was mediated by anger, frustration, and relaxation using bootstrapping procedures (using d′ as the outcome variable; see Table 1 for correlations among key variables).

The direct effect of an unfair interruption on performance was significant, $b = -.34$, $SE = .16$, $t = -2.08$, $p = .040$. As expected, the unfair interruption evoked greater anger than the control condition, $b = .58$, $SE = .17$, $t(114) = 3.34$, $p = .001$ [$R^2 = .09$, $F(1, 114) = 11.12$, $p < .001$]. When we included the mediation, the direct effect of an unfair interruption was no longer significant, $b = -.24$, $SE = .17$, $t(113) = -1.40$, $p = .165$, whereas the effect of anger was significant, $b = -.18$, $SE = .09$, $t(113) = -2.07$, $p = .041$

Table 1 Correlations between task performance and emotion variables in Study 4

	Sensitivity	Fairness	Anger	Frustration	Sadness	Relaxed	Task difficulty
Sensitivity (d′)	1						
Fairness	.07	1					
Anger	−.24*	−.24**	1				
Frustration	−.29**	−.26**	.51**	1			
Sadness	−.02	−.07	.24**	.09	1		
Relaxed	.27**	.28**	−.43**	−.31**	−.18	1	
Task difficulty	−.11	−.01	.24**	.36**	.02	−.27**	1

Correlation matrix among Study 4 task performance, task perception, and emotional reactions. All variables scored such that higher values mean better performance, more felt emotion, or higher perceptions of task difficulty. Sensitivity refers to performance in the critical block

* $p < .05$, ** $p < .01$

[$R^2 = .07$, $F(2, 113) = 4.37$, $p = .015$]. The indirect (mediation) effect was significant, as the 95 % confidence interval produced from the corrected bootstrap analysis (10,000 samples) did not overlap with 0; indirect effect = −.10, *SE* = .06, 95 % CI [−.26, −.004] (Fig. 3).

We also tested whether the closely related emotion of frustration ($r = .51$ with anger) was a mediator. The unfair interruption evoked greater frustration than the control condition, $b = .56$, $SE = .21$, $t(114) = 2.69$, $p = .008$ [$R^2 = .06$, $F(1, 114) = 7.26$, $p = .008$]. When we included the mediation, the direct effect of an unfair interruption was no longer significant, $b = -.23$, $SE = .16$, $t(113) = -1.40$, $p = .164$, whereas the effect of frustration was significant, $b = -.20$, $SE = .07$, $t(113) = -2.76$, $p = .007$ [$R^2 = .10$, $F(2, 113) = 6.09$, $p = .003$]. The indirect (mediation) effect was significant, as the 95 % confidence interval produced from the corrected bootstrap analysis did not overlap with 0; indirect effect = −.11, *SE* = .06, 95 % CI [−.27, −.02].

In addition, we tested whether relaxation would also mediate the influence of unfair treatment on performance. The unfair interruption evoked less relaxation than the control condition, $b = -.41$, $SE = .20$, $t(114) = 2.03$, $p = .045$ [$R^2 = .03$, $F(1, 114) = 4.12$, $p = .045$]. When we included the mediation, the direct effect of an unfair interruption was no longer significant, $b = -.26$, $SE = .16$, $t(113) = -1.60$, $p = .122$, whereas the effect of relaxation was significant, $b = ,19$, $SE = .07$, $t(113) = 2.64$, $p = .009$ [$R^2 = .09$, $F(2, 113) = 5.79$, $p = .004$]. The indirect (mediation) effect was significant, as the 95 % confidence interval produced from the corrected bootstrap analysis did not overlap with 0; indirect effect = −.08, *SE* = .05, 95 % CI [−.22, −.006].

Finally, we tested whether sadness, an emotion that was negative like anger or frustration but lacked the same level of arousal, would mediate the influence of unfair treatment on performance. When we included the mediation, the direct effect of an unfair interruption remained significant, $b = -.34$, $SE = .16$, $t(113) = -2.07$, $p = 041$, whereas the effect of sadness was still not significant, $b = ,001$, $SE = .13$, $t(113) = .005$, $p = .996$. The indirect (mediation) effect was not significant, as the 95 % confidence interval produced from the corrected bootstrap analysis did overlap with 0; indirect effect = .0001, *SE* = .02, 95 % CI [−.04, .05].

Discussion

Study 4 illustrated a boundary condition for the role of unfair treatment on increased task performance. As the task completed becomes more difficult, the role of unfair treatment appears to transform from helpful to harmful. Unlike Studies 1–3, unfair treatment resulted in worse performance in Study 4, as participants needed to work their way through a more demanding cognitive task that also lasted considerably longer than the outcome measures used in Studies 1–3. Furthermore, participants receiving unfair treatment reported feeling more frustration and anger as well as less relaxation. However, it's unclear whether this increased anger and frustration were directed at one specific person (e.g., the graduate student blamed for the coding error), or the general situation of having to repeat an experimental block. Finally, mediational analyses suggest that the frustration, relaxation, and anger, but not the sadness, produced by the unfair treatment accounted for worse performance on the n-back task.

General discussion

In four studies, we examined when unfair treatment leads to better or worse task performance. In Study 1 we analyzed NBA players' free throw accuracy after an unfair interruption. NBA players were more accurate following an unfair interruption (clear path fouls) than other fouls. In contrast, although technical and flagrant foul shots shared the same unfamiliar shooting context (shooting free throws alone), players were less accurate when attempting technical and flagrant foul shots than regular foul shots. Thus, Study 1 showed that improved performance was specific to the unfair interruption, and not interruption per se. In Study 2, we analyzed NHL players' penalty shot accuracy. Like basketball players, hockey players were more likely to succeed following a violation that suggested unfair treatment. Thus, the first two studies showed that people perform better after an unfair interruption using concrete performance data after a clear case of unfair treatment in the context of professional sports.

Although the first two studies have several strengths (e.g., large data, actual real-world performance outcomes, clear cases of unfair treatment), one major limitation was their correlational nature. The causal role of unfair interruptions cannot be firmly established from the type of data used in Studies 1 and 2. In Study 3, therefore, we experimentally manipulated the presence of unfair treatment. Replicating the first two studies, participants receiving an unfair interruption in a putting competition were more accurate after that attempt had been undeservedly nullified. Thus, Study 3 helped establish the causal role of unfair interruptions on improved task performance. Using both correlational and experimental methods across three different tasks and samples, we found that unfair interruptions were associated with improved task performance. For the first three studies, however, the tasks used were relatively easy (at least for those who performed the task). It was unclear, therefore, whether unfair interruptions would result in better performance when the task is more demanding. In light of Jannsen's (2001) findings, we predicted that performance would worsen if the central task were more demanding. In Study 4, therefore, we used a n-back task, which is a working memory task with progressive difficulty. Unlike Studies 1–3, we found that unfair treatment resulted in lower accuracy and objectively worse performance. Furthermore, the negative effect of unfair treatment in Study 4 was explained by experiences of negative emotions that had high arousal, such as anger and frustration, but not by the experience of negative emotions that lacked arousal, like sadness.

These findings have several important theoretical implications for the literature on fairness and performance. Meta-analyses showed that perceived fairness is positively associated with job performance (Cohen-Charash and Spector 2001; Colquitt et al. 2001). However, these effect sizes were small to medium. Recent studies identified some important moderators concerning the relationship between fairness and performance. For instance, fairness was positively associated with performance for workers intended to stay with the current organization. However, fairness was inversely associated with performance for workers who did not intend to stay with the current organization (Collins et al. 2012). Likewise, unfairness was associated with better performance when work demands were very low (Janssen 2001). Whereas previous studies finding a surprisingly positive effect of unfairness on performance were concerned with chronic levels of organizational fairness, our studies focused on unfairness in the context of a specific task. Our results add to this newly emerging literature that shows the results of unfairness are not universal; rather, the results of unfair treatment depend crucially on the situational context or the task used as an outcome measure.

Study 4 findings also clarified psychological mechanisms underlying the link between unfair treatment and task performance. So far, it was unknown why people should perform worse under an unfair environment on a moderately demanding task but perform better when the task is relatively easy. We predicted that the experience of anger, which was also characterized by heightened frustration, is one possible mediating variable. Anger is an approach emotion (Harmon-Jones et al. 2011) that helps achieve an action-oriented remedial behavior. Just as arousal helps well-practiced task performance, but impedes difficult task performance (Zajonc et al. 1969), we expected that anger would help improve performance of a well-practiced or an easy task, whereas it would impede performance of a difficult task. Although we did not assess anger in Studies 1–3, basketball players display a clear feeling of anger when they get a clear-path foul. Similarly, hockey players routinely show their anger when being awarded a penalty shot. Though we cannot be sure about Study 3 because we did not videotape participants' reaction to an unfair interruption, we believe that anger was a normative reaction in that context; when participants thought they putted well and their putt was going toward the hole, their putt was taken away by an opponent. Thus, the patterns of results from Studies 1–3 fit our theoretical predictions that unfair interruptions evoked anger, which in turn helped perform an easy task better than usual, though we did not directly show a positive correlation between anger and performance in these studies.

In Study 4, we assessed anger, and demonstrated that unfair interruptions evoked anger and frustration, which in turn impeded performance of a progressively difficult task. When anger is functional, unfairness will lead to better task performance, whereas when anger is not functional, unfairness will lead to worse performance. It is important to test anger as one mediator in the link between unfairness and better performance.

More generally, these results suggest that fairness violations may create psychological changes that are more nuanced than previously believed. Specifically, unfair treatment may not solely produce unhappiness (Oishi et al. 2011), or a desire to punish the violating parties (Henrich et al. 2006) but might also alter focus under the "right" conditions. In those instances where unfair treatment was associated with improved performance, the outcome measured used—free throws, penalty shots, and putts– did not exclusively depend on physical strength. One cannot simply make more free throws, score more goals, or shoot more accurate putts by solely exerting more physical effort. Rather, such tasks utilize a complex skill set that extends beyond physical capability and instead require a high degree of precision. The professional athletes, as well as the novice putters, already possessed the strength required to get the ball in the hoop, the puck in the net, or the putt to the target. However, it was only after unfair treatment that accuracy and performance improved. When the task is sufficiently rehearsed or straightforward, fairness violations may not just amplify specific emotions; they may also alter one's ability to focus on the task at hand (or at stick, or at putter). Conversely, when the task is particularly complex or demanding, the increased anger produced by unfair treatment may lessen one's capacity to focus on performing accurately, leading to more errors and worse performance.

These results also suggest that unfairness need not be a lasting aspect of one's environment in order for it to influence behavior. While much previous research has focused on contexts that are chronically and consistently unfair (e.g., Collins et al. 2012), the unfair treatment in this report occurred during a much smaller timeframe. Across all four studies, the unfair treatment took place only minutes before subsequent performance was measured. Yet, performance was still influenced by these more passing and momentary unfair actions. Such results suggest that more everyday and temporary acts of unfairness can nevertheless alter behavior.

While stimulating, these results have limitations. Most notably, though it's reasonable to expect that the situations involved in Studies 1–3 created a sense of anger, we did not or could not measure felt anger. As a result, the findings from Studies 1–3 could be the result of other mechanisms, such as increased effort among players or participants who received unfair treatment. We could have measured anger in Study 3, either through asking participants to report anger before their "re-do" putt or through having the experimenter code for expressed anger, but felt that these methods would have increased participant suspicion or suffered from low reliability (i.e., a single rater). Regardless, it will be important for future work to show a direct and positive effect of anger on relatively well-practiced or low-effort tasks.

An additional limitation is that those tasks found to be improved by unfair treatment were all physical and related to sports, while the task found to be hampered by unfair treatment was more cognitive. While it may be beneficial to investigate whether this same processes occur in other sports (e.g., soccer), future research will need to examine when unfairness harms performance on physical performance as well as when unfair treatment aids performance on more cognitive tasks. Furthermore, it remains unclear whether the same outcomes would arise in tasks that took place in different professional and competitive contexts. For example, one notable limitation of the current results is that the source of unfairness differed between studies. In Studies 1-3, the unfair treatment came from an opponent. However, in Study 4, there was no direct competitor, and the unfair treatment came from someone the participant did not know. Studies 1–3 also contained an audience, such as the sports crowds in Studies 1–2 or the experimenter in Study 3, whereas Study 4 had no audience and took place in a cubicle. Subsequent work will need to examine whether an audience is necessary for anger to improve performance, and will also need to investigate whether the source of the unfairness—such as from a friend, a colleague, or an authority figure—would produce the same effects, as previous studies have shown that our perceptions of those giving the unfair treatment alter future emotions and actions (De Cremer and Van Hiel 2006).

Finally, our experimental studies (Studies 3 and 4) were constructed such that the unfair treatment also created a momentary interruption in performance, compared to the control conditions that experienced no interruption in performance. This brief break created by the interruption could have led to the superior performance (in Study 3) or worse performance (in Study 4) in the unfair treatment conditions. However, while such a break may have aided performance in Studies 3 and 4, the basketball players in Study 1 and hockey players in Study 2 experienced breaks in performance before all free throws, penalty shots, and shootout shots, yet performance only increased when these attempts were preceded by unfair treatment. Thus, while interruptions occurred after unfair treatment in our experimental studies, there were no differences in interruptions in our correlational, real-world studies.

Aside from the source of the unfair treatment, further studies will need to clarify the role of intentionality. It will be important to better examine how the effect of unfairness on performance differs upon seeing the unfair treatment as intentional (as was likely the case in Studies 1 and 2), or whether similar outcomes exist following unfair treatment that is believed to be more accidental (as was likely the case in Studies 3 and 4). Finally, future research should better elucidate the mechanisms behind the observed effects of unfair treatment on performance. For instance, while the results of Study 4 suggest that emotions like anger and frustration play an important role in understanding how unfairness influences task performance, it is ambiguous whether this effect is further derived from motivations that are internal ("I had such an easy chance to score, so I better make up for it") or external ("How dare my opponent do that!"), as well as to what extent other emotions may mediate the influence of unfairness on performance.

In summary, whereas past research suggests that guilt may harm performance on skilled tasks (Haynes and Gilovich 2010), feeling wronged may improve performance when performance is sufficiently practiced or low in demand but end up hurting performance when the task becomes overly difficult or stressful. Across a number of physical and cognitive tasks, fair treatment appears to remain an essential concern, but the outcomes following unfairness depend on the ease and demands of the task. Depending on the task, the anger and frustration created by fairness violations can either enhance or disrupt the focus, concentration and precision required to excel.

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