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The Influence of Crowd Noise upon Judging Decisions in Muay Thai

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Background: Home advantage has been demonstrated across a number of sports, yet questions still remain over the causes of the phenomenon. Crowd effects on sport officials have been one mechanism proposed in the literature. This study attempted to investigate the impact of crowd noise on home advantage by examining the influence of crowd noise on the judgement decisions of Muay Thai officials. **Method:** Using a repeated measures design, 10 experienced Muay Thai judges observed a video of a Muay Thai contest in two different conditions: one with and one without crowd noise. Judges recorded the number of strikes each competitor made using mechanical counters with a comparison made between conditions. **Results:** Judges awarded 1.23 more strikes on average in the presence of crowd noise when compared to the no crowd noise condition. Crowd noise influenced some judges greatly but other far less. The results from a within subject ANOVA analysis suggested the differences between noise conditions were statistically significant ($F(1,39) = 4.513$, $P = .04$, $\eta^2 = .104$) as was the home advantage effect ($F(1,39) = 4.087$, $P = .05$, $\eta^2 = .095$). **Conclusion:** Crowd noise increased the scores of Muay Thai judges resulting in an advantage to the home competitor. Possible reasons for the findings include informational conformity, the use of a noise heuristic, cue learning or perceptual errors. Avenues for future research are offered.

Keywords: Home Advantage; Crowd Noise; Decision Making; Officiating Bias; Muay Thai

Introduction

Historically, sports spectators appear to have held the belief that they can influence performance, as early as 216 BC, Polybius suggested that a cheering crowd influenced the outcome of a boxing match (Guttmann, 1986). This belief appears to be an enduring one. Strauss (2002) found in a survey of 10,063 spectators at an American football match held in Germany, that 61.2% of those who responded felt spectators exerted a strong influence on the outcome of American football games. Along with the positive influence supporters' perceive that their cheering may have on their player's performances, they also presume that their taunts and boos can distract the away team and influence referees' decisions (Wolfson, Wakelin, & Lewis, 2005).

Home advantage research suggests that sport fans' assumptions may have some foundation. Nevill, Newell and Gale (1996) found that absolute crowd size was positively related to the home advantage in English and Scottish soccer. They examined crowd factors associated with home advantage in English and Scottish soccer matches and concluded that the home crowd influenced officials' decisions. Home advantage appears to decrease with referee experience, with referees of different experience varying significantly in awarding yellow card and penalties (Boyko, Boyko, & Boyko, 2007). The mechanism postulated for this difference is crowd noise.

A number of researchers have chosen to use video evidence to investigate crowd noise effects on sports officials' decisions. Nevill, Balmer and Williams (2002) used a quasi-experimental design to examine if the presence or absence of crowd noise would influence officials' assessments of the legality of 47 challenges/incidents during a recorded English Premier League match between Liverpool and Leicester City. The study involved referees watching and assessing various tackles and challenges recorded on videotape and found that the presence of crowd noise had a significant effect on the decisions made by the referees. The officials (n = 40) viewing the challenges with background crowd noise were in close agreement with those of the match referee and awarded significantly fewer fouls (15.5%) against the home team when compared with those watching in silence. The author's found that there were no real differences between conditions in how many times officials penalized the away team, suggesting crowd noise reduced the number of fouls awarded against the home team rather than increasing the number of infractions called against the visiting team. A similar study was conducted recently by Unkelbach and Memmert (2010) but instead of using video footage from the same match, they instead used 56 foul scenes from 56 different soccer games. However, their results differed from those of Nevill, Balmer, and Williams (2002) in that they found an increase the number of yellow cards awarded to the away team rather than fewer challenges awarded for the home team when crowd noise was present.

The observed effects of crowd noise found by in a laboratory setting have been supported by findings in a "real world" setting by Pettersson-Lidbom, and Priks (2007). In 2007 the Italian government forced the football clubs that had stadiums with deficient safety standards to temporarily play their home games

without spectators (Pettersson-Lidbom, & Priks, 2007). In total 24 games were played without spectators and this allowed Pettersson-Lidbom and Priks the opportunity to make a direct comparison with games played with a crowd. They were able to compare the decisions made by the same referee in games with no spectators at all, and with many thousands of spectators. They made comparisons of the number of punishments (fouls, yellow cards and red cards) awarded by the referee. The findings suggested Italian referees punished away players more harshly and home players more lightly when the games are played in front of spectators. The authors suggested this was evidence of social pressure applied to officials by the crowd who consciously modified behaviour. In a recent qualitative study involving semi-structured interviews of five soccer referees the referees reported they did not feel the crowd influenced them in any conscious way, but they acknowledged crowds may influence their decisions in an indirect manner (Lane, Nevill, Ahmad, & Balmer, 2006).

While the impact of crowd noise on officials' decisions has been demonstrated using different methodologies, the mechanism for this is still largely speculative. Explanations for the phenomena can be considered from different theoretical perspectives, with explanations ranging from social conformity to cognitive biases. The social conformity explanation centres on referees and judges conforming to the views of the majority of spectators in attendance when making certain decisions. The majority view is generally clearly discernible by a referee or judge when officiating, particularly given a vocal partisan crowd. Several studies conducted in a sporting context have demonstrated that judges are influenced by conformity effects (e.g., Scheer et al., 1983; Vanden Auweele et al., 2004; Boen et al., 2006, 2008). These studies have focused on what has been labelled the conformity effect or the tendency of judges to adapt their scores to be similar to the scores of their colleague judges. However, it could be argued that in certain circumstances judges may adapt their scores to the views of supporters in a similar way.

Conformity may be the result of either normative influence or informational influence (Deutsch & Gerard, 1955). It has been suggested that individuals' motives for conforming include accuracy, self-related factors and other-related factors (Pool & Schwegler, 2007). Cialdini and Goldstein (2004) implied people conform because of a desire for accuracy, affiliation or maintaining positive self-concept. In the case of judges and referees it is possible that one or more of these influences may impact on their decisions. Certainly it appears that most of the time people have multiple motives and informational and normative conformity occurs simultaneously (Stangor, 2004).

A number of authors have suggested motivational hypothesises associated with conformity to explain for their findings. For example, Nevill and colleagues (2002) suggested referees award fewer fouls as they wished to avoid displeasing the home crowd, thus conforming to the views of majority of supporters. In a similar vein, Sutter and Kocher (2004) suggested while soccer officials attempt to balance pleasing governing institutions by being impartial with attempting to please the crowd, home bias results from the crowd's more immediate influence.

A plausible alternative explanation is that officials use crowd noise as a heuristic, by providing additional information outside of the actual evaluation criteria to simplify the judgement task. Simon (1990) has described heuristics as "methods for arriving at satisfactory solutions with modest amounts of computation, (p. 11)". These mental short cuts have been associated with the automatic and unconscious functions of the mind. Stanovich and West (2000) proposed that humans have two mental systems; one that is largely unconscious, automatic with a propensity to makes quick intuitive decisions, and a second encompasses the other slower more deliberate contemplation involved in analytic intelligence. Tversky and Kahneman (1974) demonstrated that in particular situations the automatic intuitive system uses a heuristic to assist in a difficult judgment, such as the instantaneous decisions performed by sports officials.

While such heuristics play in a role in reducing the effort required by a particular task and can be beneficial in a number of situations, they also causes predictable biases (systematic errors) in judgement (Shah & Oppenheimer, 2008; Tversky and Kahneman, 1974). In making a decision, a sport official may erroneously place equal or more importance on the auditory information from the crowd as they do on the visual information from the observed action, causing a biased judgement that is influenced by the vocal support of the crowd.

In combat sports such as boxing and Muay Thai, judges have to make an assessment of the quantity and quality of blows delivered. One of the tasks required to achieve this is to determine if a blow delivered by one contestant makes contact with an appropriate target area on their opponent's body. They have to do this while at the same time assessing a blow's effectiveness. This is not always a straightforward task. Not only are blows delivered very quickly but a judge's view may also be obstructed by corner posts, the referee or the boxers themselves. Any of these factors lead to a level of visual ambiguity that could allow influence by the sound information provided by a crowd cheering on or just after delivery.

The possibility of crowd noise influencing the decisions of Muay Thai judges is potentially greater than the effect demonstrated on soccer referees (Nevill, Balmer, & Williams, 2002; Pettersson-Lidbom & Priks, 2007; Unkelbach & Memmert, 2010). The average number of attacks used in an elite Muay Thai during match has been found to be 183.5 (± 27.45) (Myers & Nevill, 2008). As such, during each round a Muay Thai judge has to make numerous subjective decisions, deciding if a particular blow is effective and if it strikes an appropriate target (Myers, 2007). It is quite common to see a "home town" fighter being cheered enthusiastically with every kick, punch, elbow or knee delivered, whether these successfully land on target or not. If crowd noise influences soccer referees decisions when viewing taped tackles. It seems a distinct possibility that the judgments made by Muay Thai officials could also be influenced by crowd noise. Balmer, Nevill, & Lane (2005) found home advantage in European championship boxing and a similar effect may also be evident in Muay Thai as a result of crowd noise.

The aim of the present study was to explore the effect of crowd noise on the scores awarded by qualified Muay Thai judges and if this resulted in any home advantage effect. To do this we used a repeated measures design similar to that used by Balmer et al., (2007) to investigate crowd noise effects on soccer referees. However, rather than investigating the influence of noise on soccer referees, we assessed crowd noise influences on qualified Muay Thai judges. It was hypothesised that crowd noise would results in judges awarding inflated scores to the contestant receiving the greater level of crowd support and this would result in an advantage to the home competitor.

Method

Participants

Following a priori power analysis (see analysis subsection for details), ten qualified and highly experienced Muay Thai judges were recruited from the UK (n = 7) and Thailand (n = 3) to take part in the present study. Institutional ethical was gained and all participants gave their informed consent to take part in the study prior to any testing commencing.

Test Video and Apparatus

A Muay Thai fight videoed from the perspective of a judge from a single angle involving a fight held a stadium in Thailand between two high ranking competitors was projected onto a screen using a video-projection system. The eventual winner of the bout (the home boxer) had the greatest vocal support with the greatest number of cheers over the course of the bout (70 cheers associated with kicks, punches and knees thrown). Nevertheless, to ensure a representative experimental design and replicate what is generally the case in an actual competition environment, the other competitor (the away boxer) did have some crowd support (44 cheers). Noise level was measured using a digital sound level meter at 73dB (A) at 2 m. Blows were recorded using two mechanical hand tally counters with the counter display covered by electrical insulation tape to obscure the recorded count score from participant.

Procedure

A counterbalanced repeated measures design was used with the judges being randomly allocated to either a noise condition first followed by a no crowd noise condition or vice versa; no crowd noise condition and then a crowd noise condition. This was done to reduce the possibility of order effects. Each judge observed the video with the crowd noise audible (the crowd noise condition) and with a low level of white noise (no crowd noise condition). After each round of the bout, the video was paused and scores for each boxer recorded. There was a minimum of two days between trials.

Preceding the start of the first trial instructions were read to participants. These instructions advised the participants that they would be watching five rounds of a Muay Thai bout twice, in two separate trials; one after the instructions were given and a second after a two-hour period. They were asked to register strikes delivered by both boxers as accurately as possible using two hand counters; one counter held their left hand and the other in their right hand. They were informed that one counter should be used to record the successful strikes of one boxer (red corner boxer) and the other counter the scores of the other boxer (blue corner boxer). They were told to do this by pressing the relevant counter once each and every time they observed a punch, kick, knee or elbow delivered by landing on the other boxer's body or head. They were advised that they would not be informed of any of the scores they had recorded until both trials had been completed to avoid any anchoring effect.

Participants were then given a demonstration and questioned to determine if they understood the procedure. After this they were told they would begin a three minute trial (one round of a different Muay Thai bout) so they could familiarise themselves with the procedure. Each participant watched the complete bout (5 × 3 minute rounds) in both conditions and registered strikes with no other participant present.

Analysis

We designed the experiment with a .8 probability of finding a significant difference should such a difference exist in our population of interest. To this end we conducted a priori power test using G power 3 software to determine appropriate sample size (Erdfelder, Faul, & Buchner, 1996) for background and a description). Using an alpha level of .05, 1-β set at .8, with a partial η^2 .15 (an effect we considered represented a meaningful difference). The calculation suggested ten participants were required to achieve this. Descriptive statistics were calculated for the noise and no noise conditions. A repeated measures ANOVA was conducted with two within subject factors, noise and boxer. The within subject factor noise had two levels, noise and no noise. Similarly, the within subject factor for boxer also had two levels; home and away. Partial eta squared was used to determine the size of effect.

Results

There were differences in the main effect of crowd noise vs. no noise (**Table 1**). However, the standard deviations were large suggesting sizeable variations in judge's scores (**Table 1**). Interestingly, while 8 judges awarded higher scores in the crowd noise condition, two judges awarded higher scores in the no crowd noise condition.

The estimated marginal means between the crowd noise (M = 14.66, with 95% confidence intervals from 12.12 to 17.21) no crowd noise (M = 13.4, with 95% confidence interval from 11.34 to 15.46) conditions suggest that in the presence of crowd noise, judges on average awarded 1.23 more strikes than in the no noise condition. The repeated measures ANOVA suggested these observed difference was statistically significant for the crowd noise conditions to a .05 alpha level ($F(1,39) = 4.513$, $P = .04$, $\eta^2 = .104$). The noise-by-home vs. away boxer interaction was also statistically significant to a .05 alpha level ($F(1,39) = 4.087$, $P = .05$, $\eta^2 = .095$).

Discussion

The presence of crowd noise did have an effect on the decisions made by the qualified Muay Thai judges and this resulted in a home advantage. Although the differences were small in terms of a noise effect, they were statistically significant. The partial eta squared result for the crowd noise effect suggests that that 10.4% of the variance in the scores awarded by judges is attributable to crowd noise, and 9.5% of the variance being attributing to crowd noise influencing home advantage. Overall crowd noise resulted in judges awarding 1.23 (5%) more strikes

Table 1.
The means and standard deviations of judges' scores in noise and no crowd noise conditions.

Boxer Corner	Conditions		
	No Noise	Noise	Difference in Means
Red	17.1 (± 9.77)	15.43 (± 8.18)	1.67
Blue	12.23 (± 6.65)	11.38 (± 5.24)	.85

on average in the presence of crowd noise. This supported the hypothesis that a crowd can have an influence on officiating (Nevill & Holder, 1999; Nevill, Balmer, & Williams, 2002; Unkelbach & Memmert, 2010) and this resulted in a home advantage, with the interaction between the boxers (home v away) resulting in a significant effect.

We believe the absence of a real crowd means normative social conformity influences are an unlikely explanation for the results of our study. Nevertheless, there are several possible explanations for the findings, which while have different theoretical foundations. Firstly, informational conformity could have played a role (Deutsch & Gerard, 1955). When a judge was viewing somewhat ambiguous exchanges during the bout, they may have used information from the crowd to help them determine the success or otherwise of a particular blow landing. For example, when a competitor's body is turned away from a judge and they see a kick initiated but not actually land, the crowd's cheer may well provide additional information and, rightly or wrongly, result in that judge considering the kick to have landed on target. Informational influence has been demonstrated in judging sport previously (Boen et al., 2008) although in that case the influence of other judges rather than a crowd.

A further explanation of the findings is the possibility judges used a "noise heuristic" (Kahnerman & Tversky, 1996). Given judges are required to make an almost instant decision on whether a blow landed or not, and the criteria for deciding that can be reasonably complex, judges may well have fallen back on schemas they had previous used by applying a "mental short cut" with noise used alongside other signals they had learned to associate with a scoring blow. In a similar way judges may well have used noise as a cue, something convincingly argued for by Unkelbach and Memmert (2010) in their recent paper. They postulated that sports officials learn to associate particular cues such as crowd noise to a particular decision in a particular context. Arguing that judges or referees might equate similar audience reactions with different outcomes, suggesting that crowd noise may lead to more-positive evaluations in figure skating and conversely a higher probability of a yellow card for fouls in soccer. In the case of the present study, judges may have learned to equate the crowd's cheers with a blow landing.

Interestingly there were very different responses to crowd noise for different judges in our study. For some judges crowd noise had the effect of increasing their scores quite dramatically, for others a relatively small increase was observed, and yet for two others the complete reverse was found with much higher scores in the no crowd noise condition. While a counterbalanced design was employed in an attempt to minimise any order effects, since the participant's viewing of the same bout was only separated by two days, anchoring bias may have impacted on the results in participant's observations in subsequent conditions. The anchoring bias is a phenomenon in which decision makers adjust too little from their initial judgments as additional evidence becomes available and this account for some of the individual differences found (Tversky & Kahneman, 1974). However, that fact that crowd noise appears to have differing effects on individual's judgement decisions may well be explained plausibly by individual-level factors other than anchoring.

Decision-making performance can be influenced by differences in both the experience of making a decision and the ability to cope with affective states during decision-making (Seo & Barrett, 2007). Certainly positive affect appears to be related to better decision making when compared with negative affect (Forgas, 1995; Isen, 2000). Although given the experimental conditions it is unlikely that emotion was influential in the results of the current study. Individual differences in responses to crowd noise are consistent with previous findings.

Research is needed in this area in an attempt made to identify the particular factors that are involved in producing individual decision responses to crowd noise. Lane et al. (2006) have proposed a Referee Decision Scale; a 9-item scale principally designed to assess individual themes and ideal-decision making themes. We suggest that this could be used to compare referee decisions between crowd noise and no crowd noise conditions. This scale, and modifications of it, appears to offer the opportunity to help determine particular individual level factors involved in evaluative decisions in the presence of crowd noise. However, until more is known regarding individual differences and crowd noise interactions and without clearly being able to identify which judges may be vulnerable to the influence of crowd noise, it can be argued that that Muay Thai judges should use some form of nose cancelling earplugs to avoid the influence of crowd noise.

Before concluding, it is important to consider any methodological limitations that may have contributed to our findings. One limitation of the present study is the fairly moderate simulation of the "real-life" situation in our experimental design. Without a real interactive crowd the possibility of normative social conformity was reduced. It would be problematic to use the type of repeated measures design used in the present study during an actual live bout. However, it would be possible to have several judges viewing several different bouts in different conditions. This would increase validity significantly with participants being surrounded by an actual crowd in the noise condition. However, it should be noted that since external and representative experimental design considerations are independent, increasing the degree of such "real world" representation might not increase external validity.

In conclusion, the results from the present study suggest that crowd noise does affect Muay Thai judges' decisions when judging Muay Thai. This adds to previous findings in others sports and point to the potential for crowd noise to contribute to the home advantage through referee or judges' decisions. In the present study, judges on average awarded more points in the presence of crowd noise and this was generally in favour of the home competitor. Several explanations could explain this, informational conformity, the use of a noise heuristic, or cue learning where judges have previously associated crowd cheers with a scoring blow. Equally, it may be that judges' perceptual accuracy was compromised by crowd noise, the differing responses the result of unidentified individual differences.

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